

S
388.1
H3L
Supp.

JAN 6 1972

LIVESTOCK AND VEHICULAR UNDERPASSES SUPPLEMENT TO FINAL REPORT 98 CASE STUDIES



Montana State Library



3 0864 1006 1763 1

A P P E N D I X

T A B L E O F C O N T E N T S

Foreword	I - III
Index to Case Studies by Pipe Sizes	IV
Index of Case Studies and Severance Situations	V - VII
Field Questionnaire in Completed Form	VIII - XI
Case Studies	I - 306

What to look for in the Case Studies:

District and location

Severance Situation

Specific Problems

Adequacy

These would be the major areas of concern; however, there is a large body of information available and once the user becomes accustomed to these case studies, they should find much useful information.



Digitized by the Internet Archive
in 2012 with funding from
Montana State Library

<http://archive.org/details/livestockvehicul3131jone>

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDIES

Foreword

Any original research material should include, as a main objective, a representative sample of the ranches and farms using underpasses. It is my opinion, based on present inventory, that there are about 1,000 private land use structures over 72" in height, exclusive of bridges. Our sample of 98 finished case studies is approximately a 10% sample representing all types of underpasses presently being built and some older designs in the metal pipe category. A total field sample of 117 case studies supplements areas of analysis.

Whereas these would not be a necessary part of the final report, it nevertheless is the documented evidence of actual history of usage. It, therefore, should be made available to those who can use the foresight to make improvements, the deficiencies of which are brought out in the case studies. It is also well to use them to advantage to point out the positive features.

Each case study contains the following:

Case Study Number, Controlled or Non-Controlled Access,

and Date of Inspection

Principal Severance Situation

Type of Operation

Location -- Geographic

Structure Type

Specific Problems

Discussion on Adequacy

Remarks

Each photograph page contains a picture of each entrance, a picture away from each entrance, and any unusual features or information pertinent to the study. Inspect the photos carefully for a closer look at stock usage, fencing, erosion, construction, fill cover, winter and drainage problems.

There are plats for 73 of the 98 case studies. They are detailed enough to get an idea of the severance situation. In particular, the farmstead location in regards to the underpass is quite important in some severance situations. In others, distances to pastures and water are important. Size of severance will aid the appraiser in comparable situations if the type of unit and carrying capacity are similar. The scale is given, principal severance situation, date of inspection, case study number, structure age, and project number. The Montana Highway District number is in the upper right hand corner.

The case studies sequence are listed by district. They are numbered by the order in which they arrived at the Helena Research Unit and usually are dated between July and October.

District #1, Missoula - 10 Case Studies (4, 5, 65-73)
District #2, Butte - 22 Case Studies (1, 2, 3, 6, 9, 16-18, 20-24,
30-35, 37, 39-41)
District #3, Gt. Falls- 18 Case Studies (25-29, 42-45, 60-63, 76-80)
District #4, Glendive - 19 Case Studies (7, 8, 11-14, 46-52, 54-59)
District #5, Billings - 29 Case Studies (81-108, 110)
Total..... 98 Case Studies

The severance situations are:

A --the headquarters and main unit are separated from winter pastures, new location.

A-1 --the headquarters and main unit are separated from the winter pastures and stockwater.

A-2 --the headquarters and winter pastures are separated from the main unit.

B --the headquarters and main unit are separated from the summer grazing pastures.

C --separated haylands.

C-1 --separated croplands.

D --community underpass; separated pastures and croplands

D-1 --access to forest permit.

E --headquarters landlocked.

INDEX TO CASE STUDIES BY PIPE SIZES

Arch and Squash Corrugated Metal

Pipe, classified by span; smallest to largest

Type A (5'10''s x 6'6''r)

P. 115, 126, 128, 138, 144, 146, 149, 152, 181, 187, 193, 196, 277

Type B (5'10''s x 7'7''r)

P. 9, 11, 13, 16, 93, 102, 105, 109, 184, 220, 280, 283, 286

6'11''s x 8'6''r

P. 30, 39, 223

9'6''s x 5'7''r Squash

P. 96

10'10¹/₂''s x 9'11''r

P. 5

11'5''s x 7'3'' Squash

P. 133, 289

12'8''s x 8'7''r Squash

P. 67

13'10''s x 9'11''r

P. 254

13'10''s x 11'9''r

P. 90, 216

14'3''s x 8'11''r Squash

P. 44, 54, 80

15'6''s x 13'10''r

P. 84, 230, 265

16'2''s x 14'10''r

P. 35, 1, 57, 87, 117, 268

16'7''s x 10'11''r Squash

P. 99, 213

17'2''s x 15'8''r

P. 64, 301

20'5''s x 13'0''r Squash

P. 271

Round Corrugated Metal Pipe

72'' (6')

P. 178, 207

84'' (7')

P. 47, 61, 163, 168, 171, 190, 210

90'' (7.5')

P. 122, 124

96'' (8')

P. 25, 155, 203, 257, 292, 295

108'' (9')

P. 134, 175, 199

120'' (10')

P. 159, 163, 298

132'' (11')

P. 130-132

156'' (13')

P. 51

162'' (13.5')

P. 233, 236

180'' (15')

P. 226, 240, 243, 246, 262, 274

Reinforced Concrete Box; Bridge Span

14's x 10'r

P. 260, 304

16's x 12'r

P. 23, 71, 75, 78, 119, 249

16's x 14'r

P. 19, 21

20's x 14'r

P. 251

LIST OF CASE STUDIES AND SEVERANCE SITUATIONS

District #1, Missoula - P. 1-24

Case Study Number	Severance Situation	Pages
4	C	1-4
5	B	5-8
65	B	9-10
66	B	11-12
67 & 68	B	13-15
70	C	16-18
71	C-1	19-20
72	A-2	21-22
73	A-2	23-24

District #2, Butte - P. 25-101

Case Study Number	Severance Situation	Pages
1	B	25-29
2	D-1	30-34
3	A-1	35-38
6	B	39-43
9	A-1	44-46
16	A-1	47-50
17	B	51-53
18	C	54-56
20	A-2	57-60
21	B	61-63
23	D	64-66
24	B	67-70
30	A-1	71-74
31	A-1	75-77
32	A	78-79
33	A-1	80-83
34	B	84-86
35	N. A.	87-89
37	B	90-92
39	B	93-95
40	A-2	96-98
41	A-2	99-101

District #3, Great Falls - P. 102-154

Case Study Number	Severance Situation	Pages
25	A-2	102-104
26	A	105-108
27	A-1	109-112
28	B	113-114
29	B	115-116
42	C	117-118
43	C-1	119-121
44	A-2	122-123
45	B	124-125
60	B	126-127
61	A-2	128-129
62	B	130-133
63	A	134-137
76	A-1	138-143
77	A-1	144-145
78	A-1	146-149
79	A-1	149-151
80	A-1	152-154

District #4, Glendive - P. 155-219

Case Study Number	Severance Situation	Pages
7	B	155-158
8	B	159-162
11	B	163-167
12	A-1	168-170
13	B	171-174
14	B	175-177
46	A	178-180
47	B	181-183
48	A-2	184-186
49	B	187-189
50	B	190-192
51	B	193-195
52	A-1	196-198
54	B	199-202
55	B	203-206
56	B	207-209
57	A-2	210-212
58	C-1	213-215
59	D	216-219

District #5, Billings - P. 220-306

Case Study Number	Severance Situation	Pages
81	B	220-222
82	A	223-225
83	D	226-229
84	B	230-232
85	B	233-235
86	B	236-239
87	B	240-242
88	B	243-245
89	A	246-248
90	B	249-250
91	C-1	251-253
92	D	254-256
93	B	257-259
94	B	260-261
95	B	262-264
96	B	265-267
97	E	268-270
98	A	271-273
99	A	274-276
100	B	277-279
101	C-1	280-282
102	A	283-285
103	B	286-288
104	B	289-291
105	B	292-294

District #5, Billings (continued)

Case Study Number	Severance Situation	Pages
106	A-2	295-297
107	B	298-300
108	A-2	301-303
110	A-2	304-306

HPR - 1 (8) RESEARCH LIVESTOCK & VEHICLE UNDERPASS

QUESTIONNAIRE

A. STRUCTURE IDENTIFICATION

1. County 1. Cascade
2. Project 2. F 73 (4)
3. Station number 3. 1124+00
4. Parcel number 4. 12
5. General location, (nearest town) 3 1/2 Mi. SE of Belt, Mont., SW 1/4 NE 1/4 Sec. 12 Twp. 18N Rge. 6E
6. Date constructed, if known 6. 1969
7. Principal severance situation Severs hay meadow used for aftermath grazing and winter feeding, cutting off access to stockwater (Belt Creek). Refer to sketch.

B. STRUCTURE TYPE - Design measurements; photograph both ends and 180° photos (4 total), if needed Refer to H-8-F, p. 4, this can be done during structure inspection.

	<u>Size</u>	<u>W X H</u>	<u>Length</u>	<u>Fill to Top of Roadbed</u>
1. Concrete pipe, arch or box	_____	_____	_____	_____
2. Arch corrugated metal pipe (Std. Dwg. 59-02, Type "B")	<u>35</u>	<u>5'10" 7'7"</u>	<u>88'</u>	<u>1'4"</u>
3. Round corrugated metal pipe	_____	_____	_____	_____
4. Machinery pass bridge type structure	_____	_____	_____	_____

Note. Photographs should contain total entrance, focus on light at opposite end. If combination drainage, so state

C. STRUCTURE LOCATION (Check one)

- Flat - level terrain with flat grade on highway.
- Top - top of vertical curve in rolling terrain.
- Side - on a downgrade roadway and sidehill.
- Bottom - bottom of drainage, gulch, vertical curve

D. STRUCTURE USE CATEGORY (Make note of skew or slope of underpass.)

1. Stock: Check one This pipe is flat.
 - Good - adequate for users' operation, high frequency of usage.
 - Fair - involves management problems, stock can't be driven through, etc
Moderate frequency of usage. young cattle are difficult to handle.
 - Poor - extensive management problems, farmer or rancher has all but given up trying to make use of it. Light frequency of use.
 - No Usage - state reason the machinery pass was abandoned

REMARKS.

The owner uses the stockpass from October to April and said that it was completely adequate for his need. He also said he had no trouble getting any of the cattle to go through the pass.

2. Machinery Pass. Check one.
- [] Good - adequate for users' operation, will accommodate all his machinery, high frequency of usage.
- [] Fair - involves management problems, cannot get a combine through, must disassemble cultivators or other machinery to pass through, not enough clearance for some grain or stock trucks. Moderate usage.
- [] Poor - extensive management problems, little usage or some combination of these plus locational factors.
- [X] No Usage - state reason the machinery pass was abandoned.
3. Drainage - Stockpass Combination. Check one.
- [] Good - water drains away rapidly, no pools are formed at entrance or inside the structure. No bog holes at either end or paths to the structure. Heavy use.
- [] Fair - most water drains away and pools form; however, entrances or paths do not become boggy. Less than three inches of silt, mud, or gravel collects in the structure. Moderate use.
- * [X] Poor - water and mud collect in and near the structure and remain wet for long periods of time. Light use
- [] Bad - unusable for livestock of any kind
- E. STOCKPASS CONDITION - Check one, comment on severe conditions.
- [X] Good - no deterioration.
- [] Fair - some chipping around the edges on concrete structures, interior aggregate loosening, metal pipe flattening or settling some.
- [] Poor - primarily very old and heavily used drainage-stockpass combinations. Probably constructed prior to 1946.
- F. STOCK AND MACHINERY PASS ACCESS - Describe in space provided
- * 1. Is the access stabilized with gravel, pavement, or riprap? _____
2. What is the physical condition of the approach? Good -- Both approaches are gently sloped.
3. Is the backslope protected against erosion? Yes, with gravel and boulders.
4. What is the nature of the topography or terrain in the vicinity of the approach?
The stockpass is in a recessed area. The entrance approach is from a level hay meadow and the exit feeds out toward Belt Creek, which is located approximately 40' east of the exit.
- REMARKS. D.3. The stockpass fills with approximately 3' of water early in the spring and normally dries out by August first. Both the owner and the Highway Dept. were aware this would happen because of the high water table in the area. However, the owners operation is such that this in no way hampers his operating procedure. At the present there is approximately 6" of water in the pipe. The owner claims he would have no trouble getting the cattle through it, if it became necessary to use the pass.
- F.1. The interior bedding material placed in the bottom of the pipe to provide footing for livestock consists of chip gravel that extends approximately 6' beyond the end of each opening.

G GENERAL LIVESTOCK CLASSIFICATION - Select one and make note of specific problems; elaborate if necessary.

1. Stockers or yearlings - buy in spring or summer, sell in fall. Usually pasture through summer.
Difficulties - driving through structure - do they use holding corrals and let the stock wander through, or do they attempt to drive them through? One suggestion was that stock prefer an uphill and away from sunlight approach to these type of structures. Have they tried feed and salt to lure them through?
- * 2. Cow - calf - year around operation: sell calves and old cows, keep replacement heifers (15% to 20% of herd). Problems sometimes encountered; driving them through is difficult, wing fences not always located so as to allow visibility at other end of pass from approach path. Calves will not always follow cows, become separated in some instances.
3. Feeder: fattening beef cattle prior to shipment. If such a situation exists, feedlots operating both sides of highway would encounter management problems of stock and equipment movement.
4. Dairy - according to some authorities, dairy cattle are normally accustomed to confined quarters (such as a dairy barn) and can be easily trained to use these structures. There will be exceptions, of course. Occasionally a dairy cow will be used to lead range cattle through an underpass.
5. Other classes - sheep, hogs, horses, mules. Do horses spook easily or lead through these structures? Will sheep use them at all?

H. GENERAL QUESTIONS

1. Has your ranching (farming) operation changed noticeably since highway construction?
No
2. If so, list basic changes and costs of new equipment where possible (equipment make and model number) Also, fencing changes, pasture rearrangement, relocating grain bins. Give maximum machinery sizes, if available. ---The owner who also does some farming said he bought a smaller duckfoot because it eliminated the necessity of moving his cleated cat back and forth across the highway. By using the smaller size he can pull it with a tractor with rubber tires.
3. Have you found it necessary to change your specific type of operation? i.e., cow-calf to yearling, crop changes, hayland to pasture, etc.
No
4. Have you sold or exchanged any property as a direct result of highway construction? Sales details, price, and size, date of sale. (Use comp. sales form.)
No
5. Describe specific snow problems with relation to underpass. Did it affect early access to summer pasture? ---The stockpass entrances did fill with snow last winter, but the owner said it didn't hamper his operating procedure. The location of this stockpass in a recessed area make it almost impossible to keep it from filling with snow.

REMARKS: G.2. This is a typical cow-calf operation consisting of 115 head of cows. The calves and old cows are sold annually and the owner keep approximately 20% of the heifers for replacement. The owner says he never had any trouble getting the cattle to use the stockpass.

- 6. What is the landowner's opinion of the structure? This information is necessary to determine the adequacy of the structure. This owner had nothing but praise for the stockpass. He said it was completely adequate for his operation and pointed out that if it hadn't been installed his operating costs would have increased. He also commented at great length on the Safety Factor.
- 7. Details of locational factors, if available. Describe alternative locations and why they may have been better or worse. ---Originally this structure was scheduled to be installed at Sta. 1125+00, but at the owners request it was put in at Sta. 1124+00. The original location would have placed the exit too close to Belt Creek. The owner feels it is in the best possible location.
- 8. How long has the structure been in use? This structure has been in use one year.
- 9. Miscellaneous:

- a. Appraised value before the taking, where available. (Total value & per animal unit.) 111.5 cow units @ \$780.00 per unit = \$87,000.00
- b. Appraised value after the taking, where available. (Total value & per animal unit.) 110.79 cow units @ \$780.00 per unit = \$86,400.00
- c. Number of underpass structures (and type) on property.
There is one stockpass on this parcel.
- d. Original costs of each underpass, if available. \$5,984.00 88' @ \$68.00 P/F
- e. Acres and Animal Units Before and After the Taking:

Total number of animal units before the taking: 111.50
 Total number of animal units after the taking: 110.79
 Total number of acres before the taking: 1,512. acres
 Total number of acres (left & right) after the taking: 1,337.30 acres left
and 133.70 acres right.

This information will not be available in all cases. Give whatever data best represents the situation.

- f. Actual pipe measurements will be necessary to compare them to the designed structure. This will give us some idea of tolerance when fitting a certain type of equipment to a particular metal pipe structure or concrete structure.
 Dimensions: W = 5'8" H = 6'8" The bottom of this pipe was filled with water, so the height was estimated.
 Pipe measurements or clearance at crucial points for machinery of minimum clearance will be necessary in some cases. For example, what is actual height from ground to that point at roof of structure a stock truck loaded with baled hay might touch. An 8' wide truckbed stacked with bales would touch at two radial points on the arch pipe. A tape and plumb bob, as well as a clamp would be necessary for one man to get these measurements.
- g. Write a narrative of items not covered or whatever judgement factors are necessary to make the investigation complete.

I believe I have covered all of the factors in the above narrative.

REMARKS: This owner, like the other two interviewed on this project, stated the Safety Factor alone more than justified the cost of installing the structure. I believe the costs for items of depreciation would have amounted to more than the cost of the stockpass at \$5,984.00, if one hadn't been installed.

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 4 Controlled access

DATE OF INSPECTION: April, 1970

PRINCIPAL SEVERANCE SITUATION: Cropland severed from headquarters.

TYPE OF OPERATION: Cow-calf -- about 150 animal units, total. Cuts 1,000 tons of hay and has kept up to 1,000 head of hogs. 393 acres remain north with headquarters and 432 acres south served by underpass. Plants some oats, barley, and alfalfa on south side.

LOCATION: Three miles west of Missoula, headquarters just north of I 90, Station 134+50, I 90-2 (9) 94, which is in Section 6, Township 13 North, Range 19 West, M.P.M., Missoula County.

STRUCTURE TYPE: 16'2" span x 14'10" rise, corrugated metal pipe, 216' in length. #192, Standard Drawing 59-04, 1969. Used for cattle and machinery, other vehicles. There is about 56 tons of plant mix on bottom.

SPECIFIC PROBLEMS: During wet periods following rain or snow, the entrance at both ends becomes quite boggy and it is possible to become stuck with a vehicle. Landowner feels the grade is too flat, poor drainage, which causes ice in winter and mud in spring and fall. Manure builds up and has to be cleaned out with a scoop in the springtime.

His 990-Holland combine has a 16' cutter head, 3' high, and cannot be taken through the underpass. There is an eight-mile circuitry because he was unable to attain an easement of access along the most direct route. The wide tool bar on his cultivator will not go through the underpass because the hinged wing gates, in their upright position, are too high at the culvert sides. This he must also move eight miles to use. His land south of I 90 is rapidly becoming commercial and there are presently four commercial gravel pits, either in past or present use. This could eventually eliminate his grain operation and restrict his usage of the structure for stock. He indicates that once his stock have become used to it, they will use it. Horses will use the structure quite readily; hogs are difficult to drive anywhere and the underpass creates no special problems not already in existence with reference to his hogs.

The landowner indicates proximity to highway has caused theft of gasoline from machinery and one tire from a plow. This had not happened prior to the construction of I 90.

ADEQUACY: From all appearances, the structure is adequate. On closer inspection, several deficiencies are noted. The entrances are not stabilized or adequate drainage provided. A rock sump has long since filled up. To quote the landowner, "Without the underpass, I couldn't operate." Restriction of crossing to one point also provides inconvenience, as well as having to move machinery eight miles to harvest grain.

REMARKS: The landowner has not had to purchase any new special equipment due to construction of I 90, however, a smaller cutter head on his combine would allow him to move the combine through.

CASE STUDY NO. 4 (continued)

This structure was installed in 1965 and could be functionally obsolete for the purpose for which it was intended by 1975, due to change in land usage. Demand for industrial sites in the area is high.

All things considered, there was not a better location for this underpass nor would a larger size have been feasible. The grade had to be elevated to fit the structure, and this would have to be considered an "economic optimum" for this operation.

The operating unit value to underpass cost ratio was 20% based on professional appraisal estimates and cost estimates by the Highway Commission.

I-90-2(9) 94
Missoula West



No. End Looking So.



So. End Looking So.



So. End Looking No.



No. End Looking No.

Case Study No. 4

Farmstead

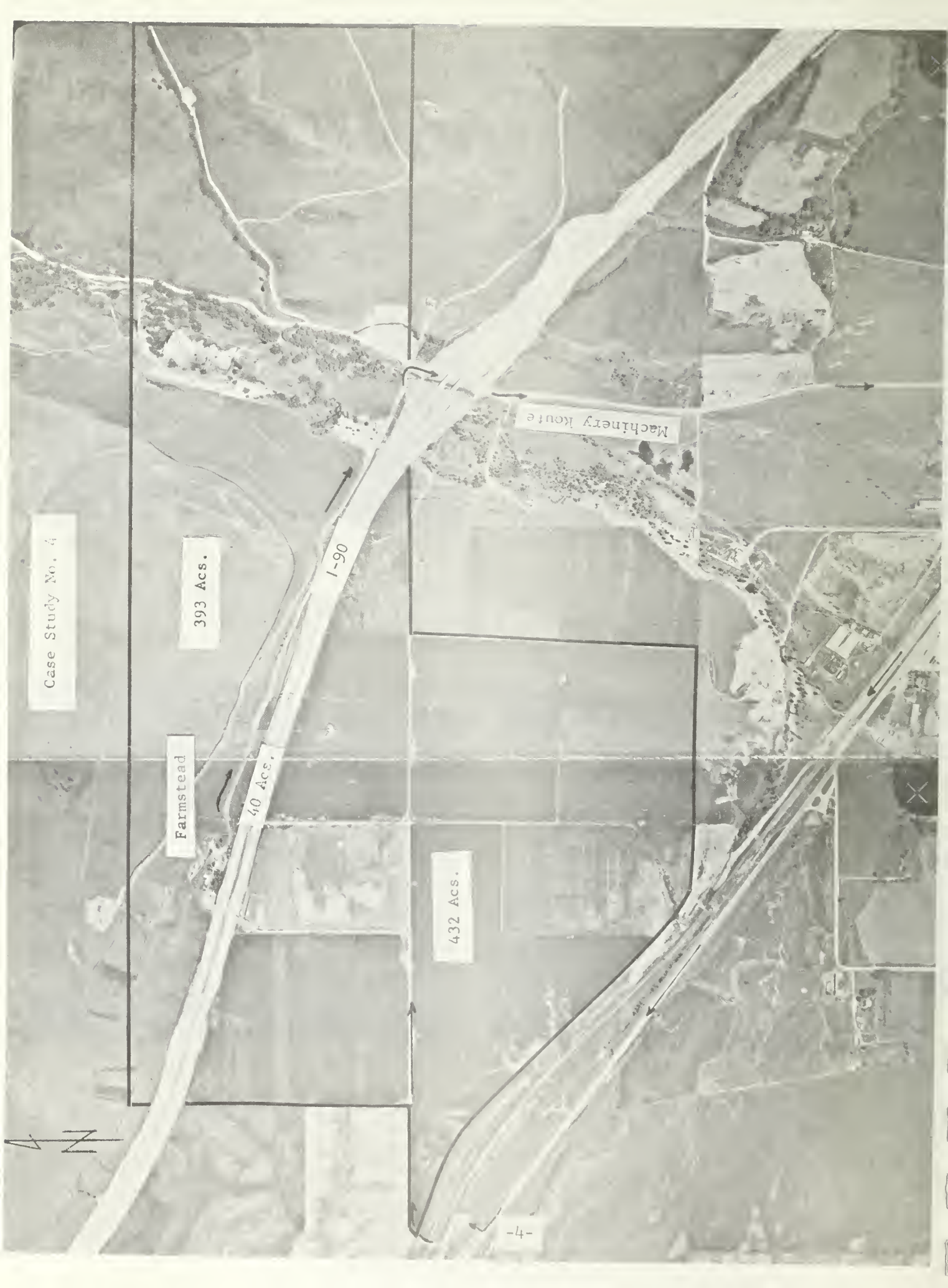
393 Acs.

40 Acs.

I-90

Machinery route

432 Acs.



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 5 Controlled access

DATE OF INSPECTION: April, 1970

PRINCIPAL SEVERANCE SITUATION: Grazing pastures separated from headquarters.

TYPE OF OPERATION: 35 animal units on grazing lands. 462 acres remain south of I 90, 142 acres of which are irrigated alfalfa and 320 of which are croplands; 400 acres of this were sold in 1968 with lease-back arrangement. There remains 416 acres north in grazing pastures.

LOCATION: Three miles west of Missoula, headquarters are just south of I 90. Underpass Station is 1283+50 of I 90-2 (9) 94 which is located in Section 36, Township 13 North, Range 20 West, M.P.M., Missoula County.

STRUCTURE TYPE: 10'10 $\frac{1}{2}$ " span x 9'11" rise, #129, 10-gauge corrugated metal pipe, 206' in length with about 4' of cover and 54 tons of plant mix on the bottom. Usage is for stock and small vehicles.

SPECIFIC PROBLEMS: Drainage and snow conditions become quite severe. The pipe was damaged by a scraper grading the median and repaired during construction. It apparently wasn't completely repaired because it has leaked since construction in 1965. It then drains to south and leaves a boggy mud-manure spot at the south entrance. A more severe problem occurs during years of heavy snowfall such as 1968-1969. The snowplows throw the snow far enough to fill in the angled inlets. This, coupled with normal snowfall, filled this particular stockpass to the point it was unusable through the winter. Due to limited winter feeding area caused by the taking, they choose to utilize the pastures north of I 90 throughout the winter. Cattle also were rubbing into wing fences until he placed a pole on the ground alongside the fence.

ADEQUACY: The users refer to the underpass as the "gopher hole" and consider it barely adequate. Stock will use it once they become used to it, and a pickup can be driven through it. Horses are no problem, however, there is no machinery access to a limited amount of hayland they would like to cut instead of graze. The taking resulted in a 15 animal unit actual loss, and the operator indicates a desire to raise the herd to the 50 animal units he once had. Every spring he uses a tractor and scoop to clean out about a foot of accumulated manure and mud.

Proximity to highway causes a variety of problems. They hate to leave home for any length of time because of the possibility of theft. Litter from passing cars is a constant headache and eyesore. A good deal of the inadequacy is size of structure by wanting to take hay equipment to the small meadow north of I 90 near Butler Creek, according to the user. A larger structure was not economically justifiable at time of appraisal. There does remain the problem of the reduced size of winter feeding area.

REMARKS: From the investigator's standpoint, the structure would appear adequate. However, the snow and drainage problems are a reality and tend to render the structure inadequate. Fixing the leak in the top center, as well as a flat or square end culvert, would eliminate this inadequacy. It would not conform to the existing slope and would not look as good as the present construction. The snow from snowplows could not fall directly in the entrances in

a square end culvert long enough such that the toe of the slope is even with the end of the culvert.

The user exercised some imagination in coping with the winged fence situation by placing an old telephone pole on the ground to guide them away from the fences. He suggested a desire to flush out the pipe with water on occasion.

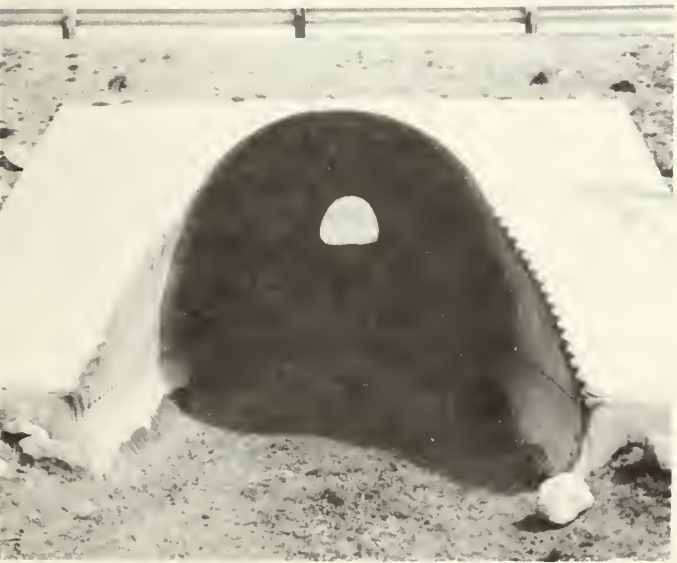
The operating unit value to underpass cost ratio was 14.5% based on professional appraisal estimates and cost estimates by the Highway Commission. Due to purchase of 400 acres south of I 90 for industrial purposes, the economic stability of the unit is a matter of time depending on when the company wishes to use the land. This then will reduce the place to a part-time 35-animal unit "ranchette". The structure may become functionally and economically obsolete for the purpose for which it was intended by 1975. It will have served its intended purpose, however.



NORTH ENTRANCE



Looking South from SOUTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

De Smet

416 acres of grazing land north of I-90

SUBJECT PROPERTY

Creek

200

USFS Aerial Fire Depot

93

BR 90

320 acres of cropland south of I-90
142 acres of alfalfa south of I-90
400 acres sold in 1967

36
10'10" span x 9'11" rise x 206' long
C.M.P. Stockpass-Drainage

31
T13N

90 10

NORTHERN

1
Missoula A Station

PACIFIC
FAP 2

FIELD

11

R20W

12

ST. PAUL

Grant

7

FAS 430

AND

FAS 263

263

14

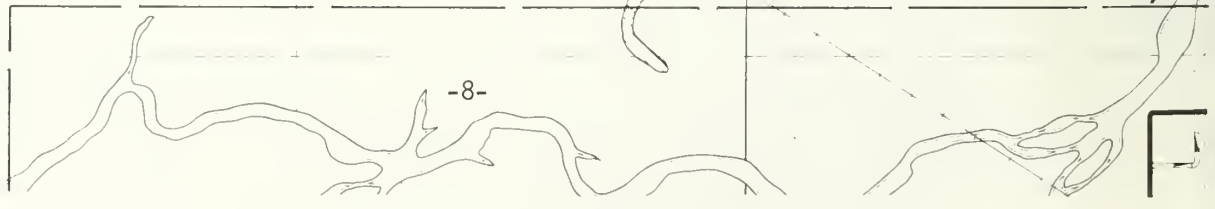
13

18

PACIFIC

-8-

CIL HILL 3292



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 65 Non-controlled access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separated winter and summer pastures.

TYPE OF OPERATION: Cow-calf.

LOCATION: Seven miles north of Avon in Township 11 North, Range 9 West, M.P.M., Powell County. Station No. 579+50 of Project S 291 (3).

STRUCTURE TYPE: 5'10" span x 7'7" rise x 54' long, corrugated metal pipe, stockpass-drainage. Actual measurements are 5' span x 7'8" rise with about 3' of fill. Pipe cannot be used for either stockpass or drainage.

SPECIFIC PROBLEMS: Apparently due to drainage problems that were not taken care of a time of construction, this has never been used. There is a large pool of water at both ends which makes it too muddy for reasonable stock access. Because of this, cattle are driven over the road. This structure has been here 9 years.

ADEQUACY: The landowner was quite irritated because of his situation and, therefore, unhappy with the structure. This structure is considered inadequate.

REMARKS: It is reasonable to conclude that if this is the best location that was arrived at, it would have been better not to have any structure installed. There have been similar circumstances where the landowner has used a structure in similar or worse situations.

S 291 (3)
AVON-HELMVILLE

5'10" span x 7'7" rise x 54'L, C.M.P.
Type "B" Stockpass-Drainage



EAST ENTRANCE - Water in pipe



WEST ENTRANCE - Water in pipe



Looking East from EAST ENTRANCE
into swampy drainage bottom



Looking West from WEST ENTRANCE
into swampy drainage bottom

S 291 (3)
AVON-HELMVILLE

5'10" rise x 7'7" span x 87' L., C.M.P.
Type "B" Stockpass-Drainage



EAST ENTRANCE



WEST ENTRANCE



Looking East from EAST ENTRANCE



Looking West from WEST ENTRANCE
Notice cattle exiting from pipe

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 67 Non-controlled access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Separated winter and summer pastures, originally. Use has since changed to homesite potential.

TYPE OF OPERATION: Prior to construction of F 215 (10), there were about 350 animal units in this ranching operation. There has been a change in use to development of homesites, and the remainder is now leased.

LOCATION: About one-half mile and one and one-half miles north of Lolo, located in Section 22 and 26, Township 12 North, Range 20 West, M.P.M., Missoula County, Parcels 15 and 17, respectively.

STRUCTURE TYPE: Two Type "B" stockpasses with 5'10" span x 7'7" rise x 114' long, corrugated metal pipe. Actual measurements are 5'2" span x 7'6" rise, no usage on No. 1 and 5'7" span x 7'8" rise, no usage on No. 2.

SPECIFIC PROBLEMS: Water stands in structure because it is located in a hole with nowhere for the drainage to go. Eight inches of water at present; there has been up to 3' of water in this structure. This is partially because there is no drainage or pipe through the railroad grade within 1,000 feet. Stockpass in Parcel 15 was intended as joint usage, however, land use changed before it could be utilized.

ADEQUACY: Because the land in this area has changed to suburban sites, the original ownership is divided up and leased out to adjoining landowners. The stockpass would be utilized if it were not for the wet location and construction features. The No. 1 structure is inadequate and unusable: No. 2 structure has never been used and he is also doubtful if cattle would use it because he feels it is too small.

REMARKS: Whereas the change in usage of this land was probably foreseen in the original appraisal, the stockpasses were installed to accommodate the landowner and render the severed portion usable for grazing without over-the-highway stock movement. There were no apparent transactions sufficient to detect a trend for development at the time and, therefore, insufficient grounds for not installing the stockpass. More consideration should have been given to the physical features, however. The landowner stated they had to purchase a portable loading chute and holding corral for \$1,600.00 and now have to truck animals from one area to another, which operation used to take 30 minutes of trailing time. This was in conjunction with stockpass No. 2.

F 215 (10)
MISSOULA-LOLO

5'10" span x 7'7" rise x 114' Long, C.M.P.
Type "B" Stockpass



Looking westerly from railroad right-of-way; showing EAST ENTRANCE



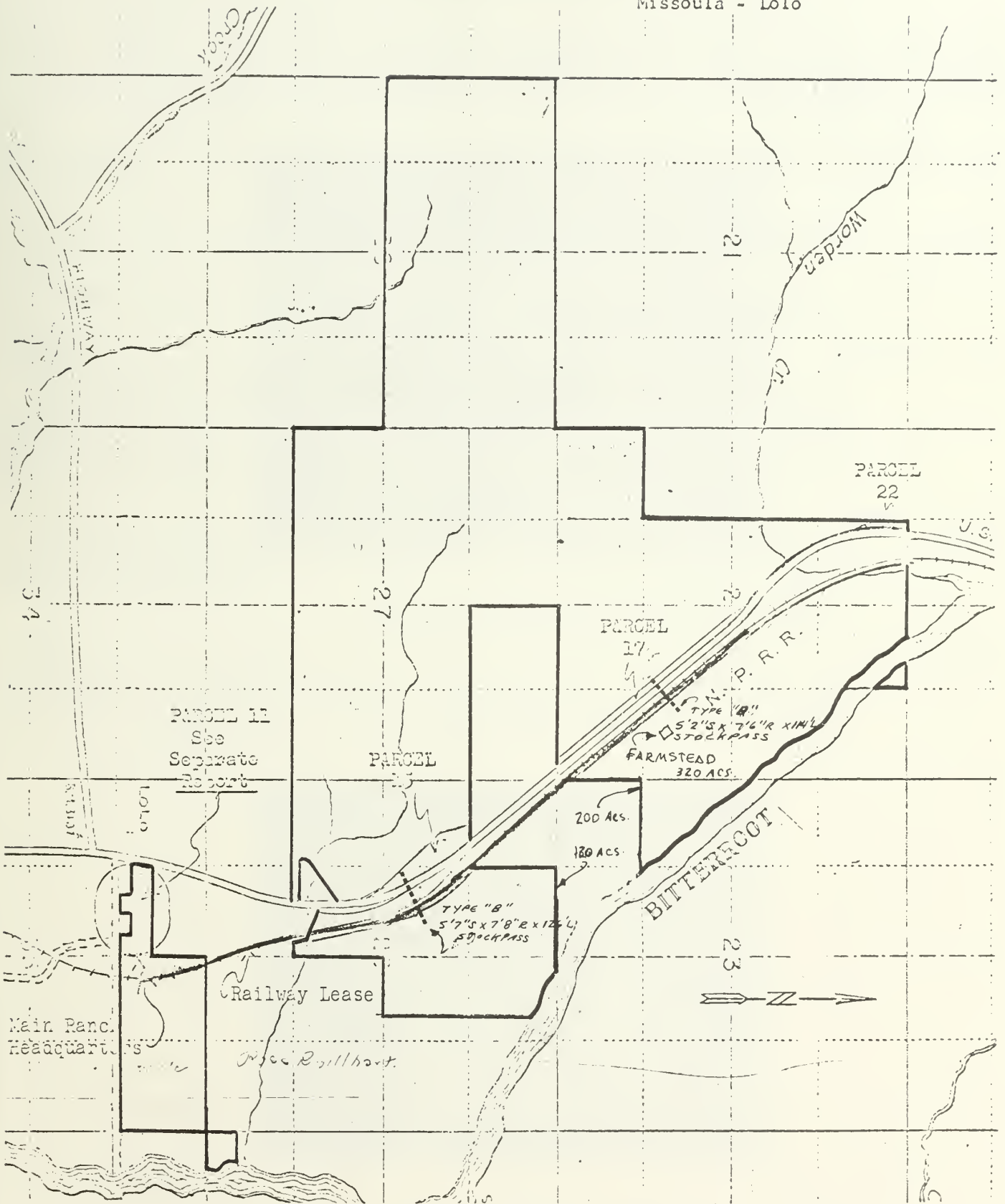
EAST ENTRANCE - Close up



WEST ENTRANCE



EAST ENTRANCE - Oblique close up



OWNERSHIP SKETCH

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 70 Non-controlled access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of irrigated land from headquarters; about 119 acres remain west and 30 acres remain east.

TYPE OF OPERATION: About 70 animal units, allowed to wander back and forth through structure.

LOCATION: On the Perma-Plains Highway in Section 4, Township 18 North, Range 25 West, M.P.M., Sanders County. Station 1111+00 of S 216 (6).

STRUCTURE TYPE: 5'10" span x 7'7" rise x 81' long, corrugated metal pipe with about 3' of cover, Type 'B' stockpass.

SPECIFIC PROBLEMS: Irrigated land returned to grazing because of access. Hay is placed in structure to start cattle through underpass, however, they are not pushed. Horses will not use this at all. The project did create some change on this property, but the investigator feels it was for the better. The structure could have been eliminated by drilling a well east of the right of way. Due to uncertainty of water, this would not seem practical.

ADEQUACY: Although it is felt a well could have substituted for this, the structure is in the only possible location. There is open land on both sides and the owner did a good job of fencing the wings. It was felt this was the best installed stockpass inspected on the study. It is considered adequate for the purpose for which it was intended.

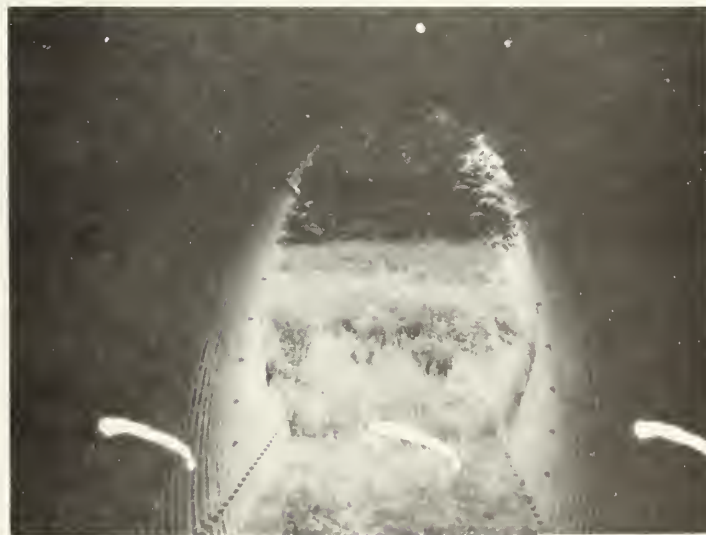
REMARKS: The wing fencing was not installed to allow maximum efficiency of the stockpass although considered to be very good. Fencing over the top of a structure allows the cattle to climb over and bunch up on the sidehill, if there is occasion to drive them rather than allow use by free movement.

S 216 (6)
PERMA-PLAINS

5'10" span x 7'7" rise x 81' Long, C.M.P.
Type "B" Stockpass



EAST ENTRANCE



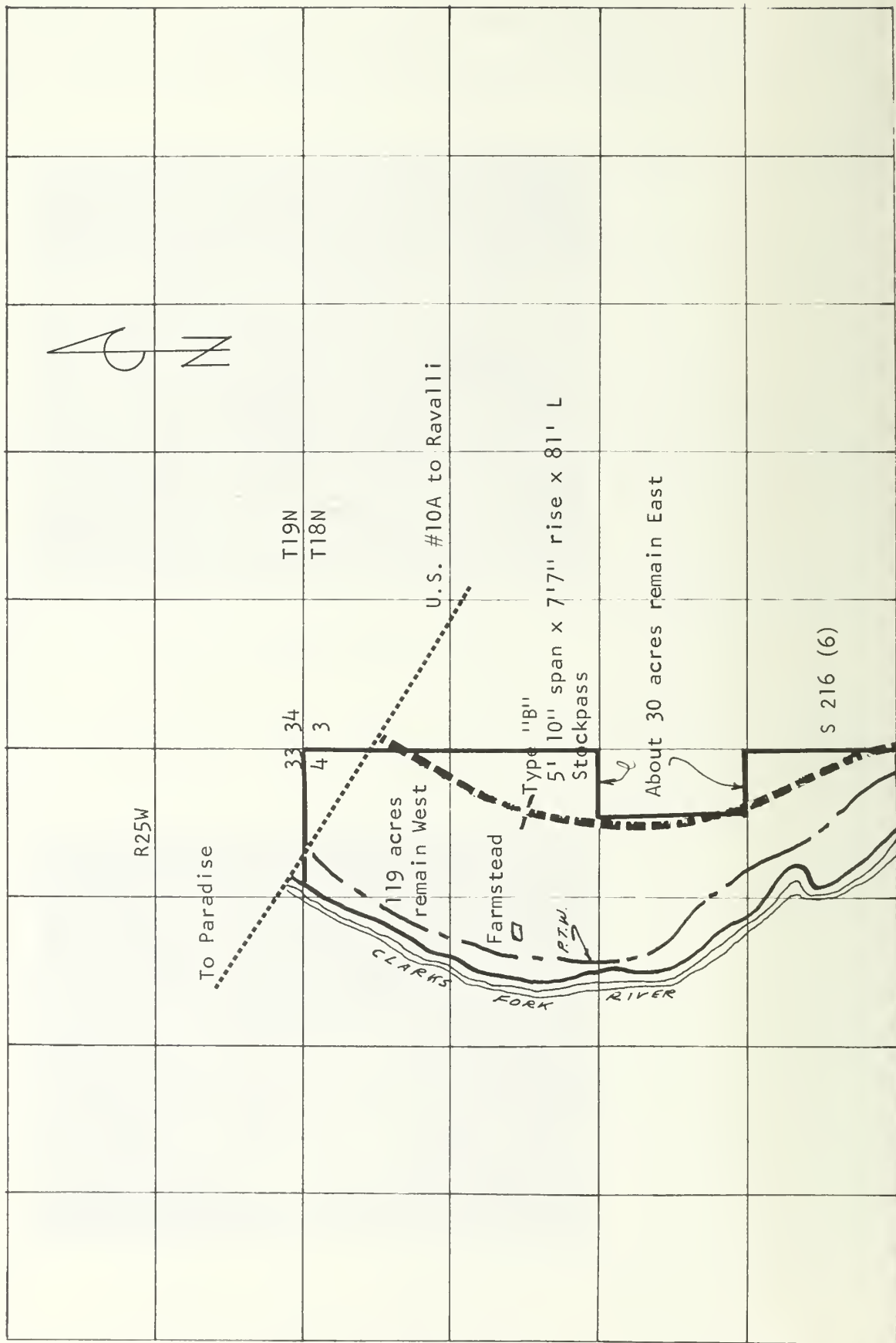
Looking East from EAST ENTRANCE

DISTRICT NO. 1

OWNERSHIP PLAT

SCALE 1"=1/4 mile Principal Severance Situation Separation of irrigated land

DATE 9/70 CASE STUDY NO. 70 STRUCTURE AGE 3 PROJECT NO. S 216 (6)



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 71 Controlled access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of cropland from farmstead and grazing land.
About 310 acres of winter wheat remain south and 43 acres of grazing and farmstead remain north.

TYPE OF OPERATION: Cow-calf and grain farming.

LOCATION: About eight miles east of Superior, located in Section 16, Township 15 North, Range 25 West, M.P.M., Mineral County. Station 401 of I 90-1 (2).

STRUCTURE TYPE: 16' span x 14' rise x 123' long, concrete box bridge-type structure.
Actual measurement is 15.7' span x 13.8' rise.

SPECIFIC PROBLEMS: After closing in the median, snow was not a problem. Prior to doing this, however, snow made it impossible to use. This was the only problem mentioned. Owner also had trouble getting cattle to cross white line on paved frontage road -- he then covered it with dirt to move stock.

ADEQUACY: The landowner considers this very good for his type of farming-stockraising operation. This appears to be the only feasible location because of proper management and access to headquarters. Originally, it was planned for 12' high and another location. It was changed to 14' high and is working out very well. It would have to be considered super-adequate for a single user.

REMARKS: Looking back, a closer analysis of this unit at time of installation would not seem unreasonable at this time. However, this was installed during one of the first interstate projects, and quite likely was properly justified for a single user.

I 90-1 (2)
SUPERIOR-EAST

16' span x 14' rise x 123' long
Concrete box bridge-type structure



NORTH ENTRANCE



SOUTH ENTRANCE

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 72 Controlled access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters from main unit; 37.5 acres remain northerly, 240 acres remain southerly.

TYPE OF OPERATION: Stocker or yearling, at present; formerly, a dairy for one year. Details not available.

LOCATION: One mile west of Superior, located in Section 28, Township 17 North, Range 26 West, M.P.M., Mineral County.

STRUCTURE TYPE: 16' span x 12' rise x 55' long, concrete box bridge-type structure, actual measurements are about the same.

SPECIFIC PROBLEMS: 14' of clearance was desirable because of truck-trailer usage. "Stockliners" normally require more than 12' of clearance, however, there are many stock trucks in use that would fit this structure. The 4' to 5' of truck bed and 6' of stock rack would easily clear this structure if not loaded higher than the rack clearance. With addition of future two lanes, it will be difficult to construct an approach from the south that can be used.

ADEQUACY: Landowner does not consider the clearance adequate. The structure would have to be considered adequate for this size operation. The underpass has been in use since 1964.

REMARKS: The investigator feels that future planning to extend this structure will be very important in order to utilize this from the south entrance. This structure does not have a concrete floor and has spread footings.

I 90-1 (1)
SUPERIOR-WEST

16' span x 12' rise Concrete Box
Bridge deck 55' long



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North into drainage ditch



South entrance, looking North

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 73 Controlled access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of headquarters from main ranching unit.

TYPE OF OPERATION: Cow-calf -- small farm.

LOCATION: Two miles east of Drummond, located in Section 10, Township 10 North, Range 12 West, M.P.M., Granite County.

STRUCTURE TYPE: 16' span x 12' rise x 125' long, concrete box bridge-type structure; actual measurements are 16' span x 11.7' rise.

SPECIFIC PROBLEMS: Snow was a major problem prior to closing the median. This underpass was used to haul logs from Forest Service and Bureau of Land Management land. At that time the road was dozed out so there was 14' of clearance. It is now filled in again and back to 11.7' of clearance. This is possible because of the type and depth of footing apparently.

ADEQUACY: Clearance originally was too low but gained clearance by cutting the road down. No other location was considered. This has been in use since 1966 and the owner has constructed a new dwelling north of right of way. This would have to be considered adequate in spite of its minor shortcomings. A 12' swather is the widest agricultural unit to use this underpass.

REMARKS: This structure serves more than one user and was probably justified on a multiple-use basis, due to the fact that timber was hauled from B.L.M. and Forest Service land.

I 90-3 (3)
DRUMMOND-EAST

16' span x 12' rise x 125' long
Concrete Box; Bridge Deck



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE
Approach to frontage road

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 1 Controlled access

DATE OF INSPECTION: May 7, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures.

TYPE OF OPERATION: Cow-calf -- total about 840 animal units on all contiguous and non-contiguous lands.

LOCATION: Headquarters on Boulder River near I 90. Stockpass located at Station 25+50; I 90-5 (9) 250, which is in Section 2, Township 1 North, Range 3 West, M.P.M., Jefferson County.

STRUCTURE TYPE: 96" corrugated metal pipe, 210' in length, dug into a sidehill for stockpass usage.

SPECIFIC PROBLEMS: This is the second season this structure has been in use. Owner contended once the cattle became use to it, they would use it; however, with each calf crop, problems arise in trying to get the calves to follow the cows. This stockpass was not originally wing-fenced directly into the stockpass in the north holding corral, and the arrangement allowed the cattle to climb to the top of the stockpass, frustrating the efforts of the rancher trying to drive them through. This location will also collect some runoff and make the area slightly muddy on rainy days. Vision through from either side is not good because the view is directly into a sidehill, not allowing maximum light or sight of grass on the other side.

About two sections of pasture are served by this stockpass. At the time of ranch inspection, 160 head were being pushed through and left to wander through on their own. The owner estimated that 160 head per twenty-four hours, or approximately 7 head per hour, used the stockpass. This investigator, along with the rancher, tried for twenty minutes to drive stock through. They would bawl, mill, climb over the stockpass, and run in circles in the small holding corral. Feed and salt through the stockpass has also been tried.

ADEQUACY: The owner considers this barely adequate for his use. He does have a river trail underneath three bridges over Boulder River. This he is quite satisfied with; however, between Monday and Thursday, May 4 to May 7, 1970, the water rose two feet during a warm spell and covered his road. During this time of high water, his only logical access to these two sections of land was through his stockpass. The Boulder River trail is generally used to drive stock on into the larger pastures in Section 10, 11, 13 and 14, Township 1 North, Range 2 West, and Sections 20, 27, 28, 29, 32, 33 and 34, Township 1 North, Range 3 West. The other logical access route is back to the Cardwell Interchange one mile west and then to the east. This is somewhat hazardous in view of the traffic, however limited it might be.

Due to low normal precipitation, snow seldom becomes a problem in this area.

This also appears to be a rather well-managed and efficient operating unit. It is one of the larger in the area and provided excellent insight because of actual inspection during stock movement.

CASE STUDY NO. 1 (continued)

REMARKS: Two deficiencies seem apparent: (1) undersize of stockpass, and (2) the fact it was dug into a sidehill.

Another location had been suggested at 18+00, further down the hill. This was ruled out as not being close enough to the severed pastures in a Justification Study. This was also the expressed opinion of the landowner. Although the landowner preferred it further east, in Section 36, the fact that it was state land would have had a negative effect on deeded lands should the lease ever be transferred. A stockpass on deeded land in Section 31, Township 2 North, Range 2 West, would have had as much difficulty in management.

One advantage of the present location is proximity to and visibility from the ranch house. It is possible a 120" corrugated metal pipe, located at about Station 15, might have allowed the stock to move through more rapidly giving the rancher more time to herd them on up into the pastures on B.L.M. and state lands. Here he would have vehicle usage as well, although driving stock is still a horseback operation, whether at Station 15+00 or Station 25+50. This is expressed as an alternate solution from the investigator's point of view. It would have mitigated an extra \$4,000.00 in damages had the owner been agreeable to it.

The landowner has tried feed and salt to lure them through the stockpass, leaving them alone, pushing them, and even considered stringing lights at this point. Over a three-day period, the landowner said all cows went through but six calves remained south in the holding corral. These calves would normally have difficulty locating their rightful mother. He is learning to live with a fairly difficult situation, but one in which he participated and preferred to any alternate view of the circumstances. He did mention his desire to remove the wing fence from the top of his stockpass into the metal pipe. Refer to photograph of north entrance. This will not be a costly item and may help somewhat.

This structure would have to be considered less than adequate.



Holding Corral



96" Stockpass



Entrance
-27-



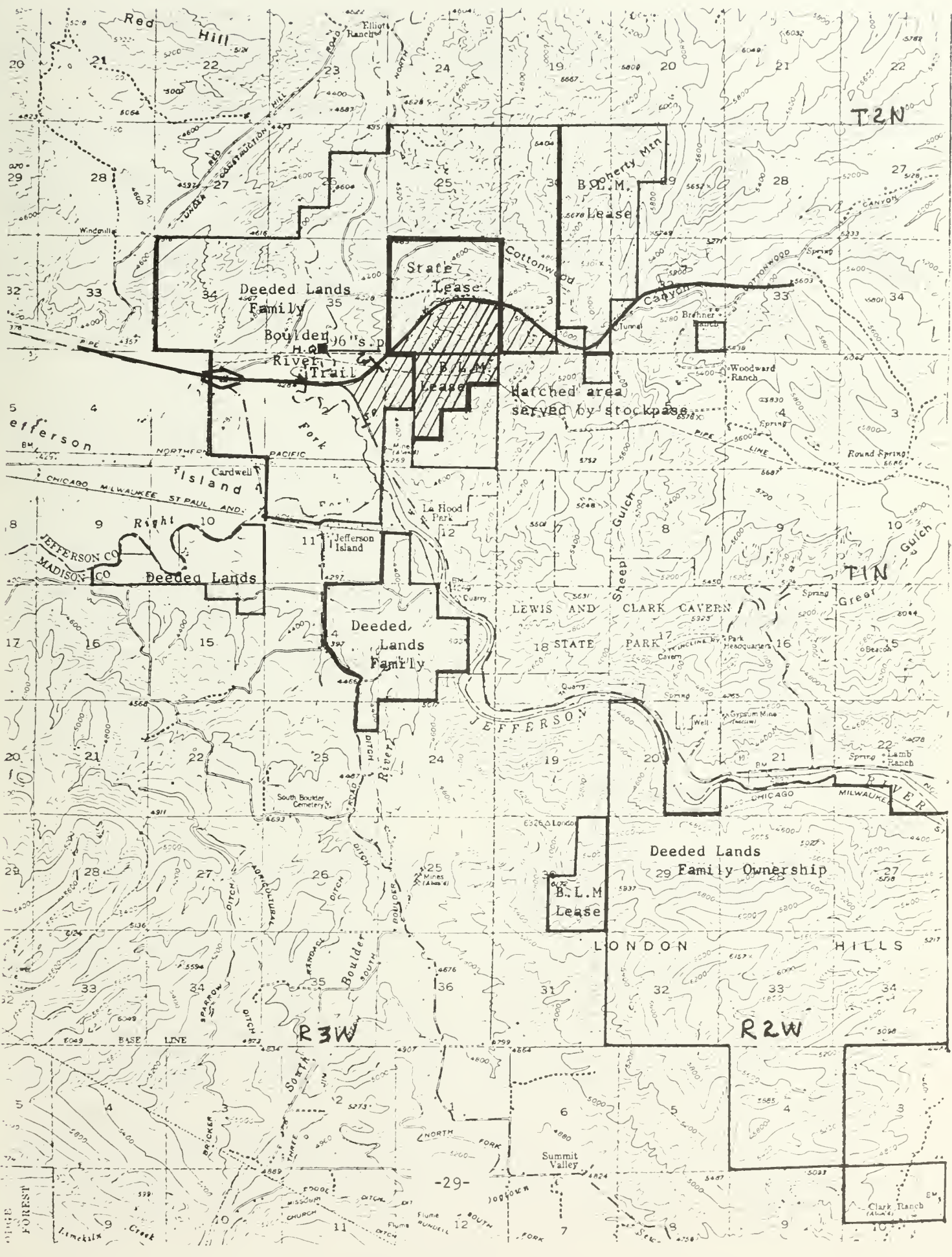
North Entrance at Boulder River Bridge



Boulder River Bridge Trail on 5/4/70



Boulder River Bridge Trail on 5/7/70



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 2 Controlled access

DATE OF INSPECTION: May 4, 1970

PRINCIPAL SEVERANCE SITUATION: Access to forest grazing permit.

TYPE OF OPERATION: Cow-calf -- yearly amount driven through depends on number of users.
Three known users at this date. The one interviewed has an 80-head permit.

LOCATION: Station 643+41, I 90-5 (25) 231, which is in Section 23, Township 2 North, Range 6 West, M.P.M., Jefferson County. Geographical description would be four miles east of rest area on Homestake Pass, on public lands.

STRUCTURE TYPE: 6'11" span x 8'6" rise, arch corrugated metal pipe, 150' in length.
Combination stockpass-drainage.

SPECIFIC PROBLEMS: This has been in use since 1962. This is the only passage across the interstate between the Pipestone Hot Springs and Homestake interchanges. The users contend it serves the purpose quite well when clean, however, as is evident on the photograph of the south entrance, the silt and mud come up to the lower bolt line, which is roughly $1\frac{1}{2}$ ' above the bottom of the pipe. This can be compared to the photograph of the north entrance which quite clearly shows the bolt line in the widest part of the culvert. This then leaves only 7' of clearance at most, and one user contends there have been times that silt and drainage runoff have left only 6' of clearance. A heavy rainfall will often tumble boulders into the stockpass from the south side, and this occurred on one occasion when one operator was using it for a shelter from a thunderstorm. His horse became quite restless, and fortunately the storm was of short duration. There was not a great deal of evidence supporting this runoff intensity; however, I would be hesitant to discount it unless I were there during a storm. Part of the invert appears to be paved, and the user mentioned the Highway Commission has cleaned the silt out several times. It is used by him once or twice in the spring, and as much as twelve times in the fall bringing cattle back from pasture. The other two stockmen would use it at about the same frequency.

ADEQUACY: The user considers this adequate for his use as long as the Highway Commission maintains the structure during runoff periods. When it does fill up, then it makes access prohibitive due to low clearance and he cannot follow stock with a saddle horse.

In that it is used for access to and from summer pasture, snow problems are not considered unless a late spring or early fall blizzard hits. If this is the case, isolation is inevitable due to restriction of access east and west in the rugged Homestake Pass area. These occasions are usually accompanied by stockmen's warnings and precautions would be taken. The person interviewed felt a location farther east would have allowed less runoff and required less maintenance. Physical inspection did not make that location apparent to this investigator.

This structure would have to be considered adequate and of optimal utility if maintenance requirements are met. At time of investigation on May 4, 1970, the stockpass had an average of three inches of ice and three inches

CASE STUDY NO. 2 (continued)

of mud. The north side has a spacious view and allows a maximum of light to stock entering from the south.

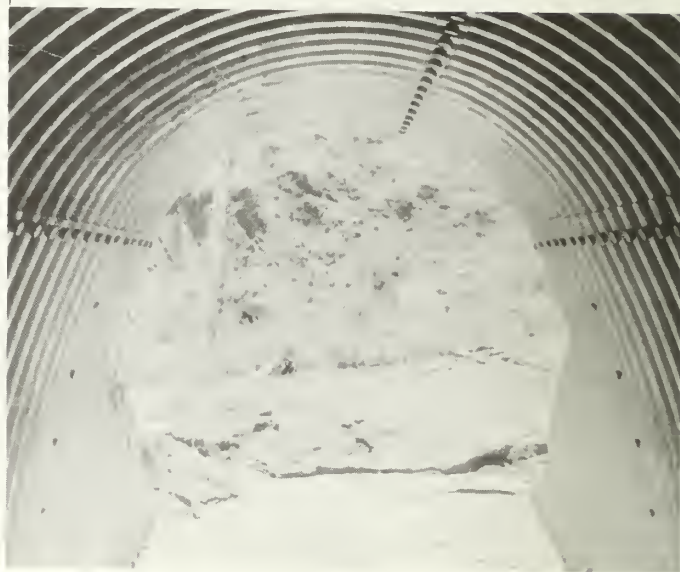
REMARKS: When a combination drainage-stockpass is considered, the Highway Commission may have to be ever aware of the responsibility of maintenance, keeping it free and clear of debris and excessive silt or gravel. This is basically a well-designed structure for the purpose, however, I doubt there are many vehicles able to scoop excess runoff material out due to the narrow width.



I-90-(5) 25 231



So. Side looking No.



So. from inside S.P.



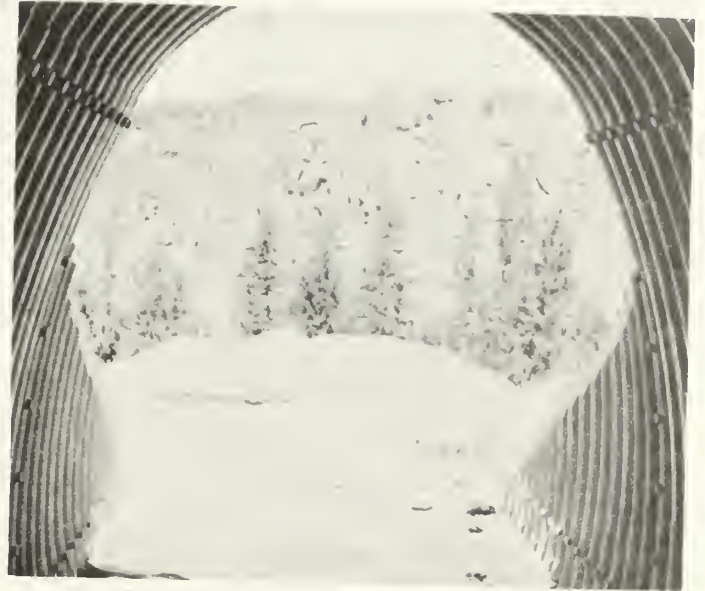
Looking down onto So. entrance



View towards SW



North End looking South



North End looking North

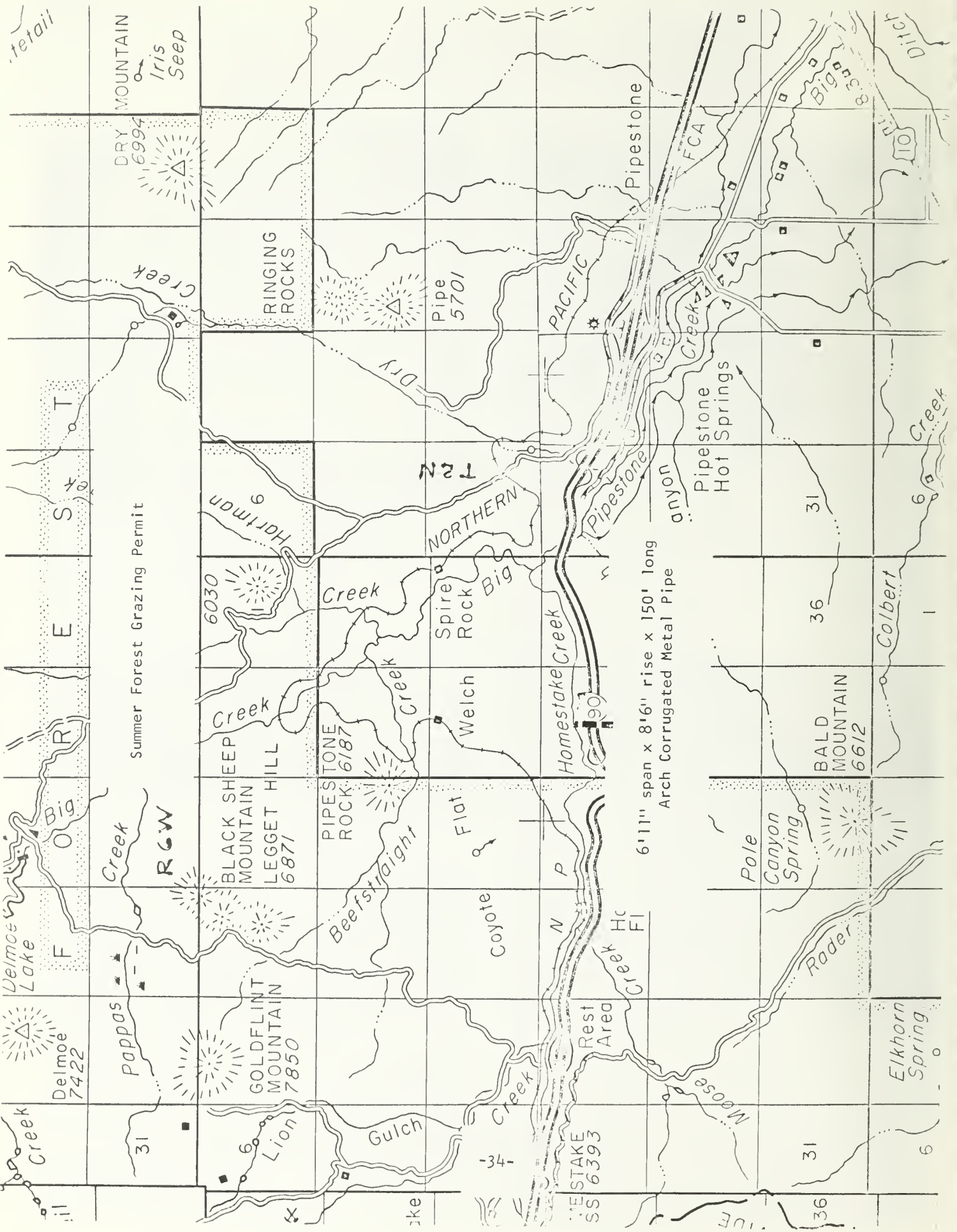


NW View from North End



NE View from North End

6'11"S x 8'6"R CMP Combination S.P.-Drainage
Homestake Pass Area



6'11" span x 8'6" rise x 150' long
Arch Corrugated Metal Pipe

Summer Forest Grazing Permit

detail

Delmoe Lake
7422

DRY MOUNTAIN
6994
Iris Seep

RINGING ROCKS

Pipe
5701

Pipestone

FCA

Big Creek

Ditch

S
T

Hartman

NORTHERN
TRN

PACIFIC

Pipestone
Canyon

Pipestone
Hot Springs

31

6
Creek

6030

Creek

Spire
Rock
Big

Home Stake
Creek

36

Colbert

RGW

BLACK SHEEP
MOUNTAIN
LEGGET HILL
6871

Creek

Welch

Flat

90

Pole
Canyon
Spring

BALD
MOUNTAIN
6612

Delmoe Lake
7422

Pappas

GOLDFLINT
MOUNTAIN
7850

Beefstraight
Creek

Colofote

Home Stake
Creek

Rader

Elkhorn
Spring

31

6

Lion

Gulch

34

REST AREA
SS 6393

31

6

36

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 3 Controlled access

DATE OF INSPECTION: May 7, 1970

PRINCIPAL SEVERANCE SITUATION: Pastures separated from source of water.

TYPE OF OPERATION: Cow-calf -- owner will pasture as many as 400 to 600 head for six months on this ownership and approximately thirteen sections of leased lands south of right of way.

LOCATION: Station 473+55, I IG 90-6 (4) 275, which is in Section 31, Township 2 North, Range 3 East, M.P.M., Gallatin County, between Logan and Manhattan.

STRUCTURE TYPE: 16'2" span x 14'10" rise, corrugated metal pipe, 214' long. Combination machinery and cattle underpass, #192 of Standard Drawings 59-04, 1969.

SPECIFIC PROBLEMS: This was originally scheduled for an 84" structural plate pipe, principally for drainage and stock water pump to furnish water south of I 90. This was then enlarged to a 16'2" span x 14'10" rise stock and machinery pass. There was a definite need for vehicle passage onto the southerly leased lands, as well as a need to move hay into the warm water springs area for winter feeding and free stock movement during snowstorms.

The only present visible problems are erosion at the north entrance during periods of runoff.

ADEQUACY: The structure appears to be more than adequate and, considering all phases of stock operations, would accommodate his 8'x13' hay truck without an excess of clearance. A statement was made in the file in reference to the pumping across right of way originally proposed, and an 84" x 200' pipe was to serve as a drainage-stockpass combination structure. This inference was such that the operation and maintenance of such would forever be in doubt.

The foreman for the operation in this area appears to be satisfied with this structure and the owner is. It is considered an adequate structure for the purpose for which it was intended Super-adequate by investigator.

REMARKS: It was mentioned in the appraisal reviews that experts and stockmen indicate young cattle will not use an 84" x 200' pipe. There are some exceptions, but this is basically a correct statement as shown by subsequent investigations.

The only question remaining was the vast amount of land served by one source of water, and the super adequacy of the structure. Records or evidence was not available as to the specific nature of these pastures. The appraisal could be made on deeded contiguous lands only, complicating the economic justification of this structure. One professional appraiser stated that the loss of the spring would deprive fifteen to twenty sections of land of available water. Others indicated ten to fifteen sections. Normally, stock will not travel more than a mile and a half to water, requiring a need for trucking water or drilling a well to adequately use all of these lands, even with stock supervision. In interviewing the landowner, he indicated the use of a nine-section pasture and cattle traveling two and

one half miles from the far reaches of the pasture to water.

Management adjustments would have allowed this operation to function with one to two feet less of clearance. The hay and stock rack on the truck was built exceptionally large to accommodate the hauling of as much hay as possible from Boulder to Manhattan. A normal load for shipment would probably run from 10' to 13' in height with a standard 6' stock rack on a 4' to 5' truck bed. A minimum of 10' of clearance is necessary for any major feeding operation hauling hay. In this instance a #180, Standard Drawing 59-04, 1969, instead of a #192 (15'6" span x 13'10" rise, instead of a 16'2" span x 14'10" rise) may have sufficed.

I-IG-90-6(4)
Manhattan West

16'2" span x 14'10" rise x 214'L CMP



NORTH ENTRANCE



SOUTH ENTRANCE

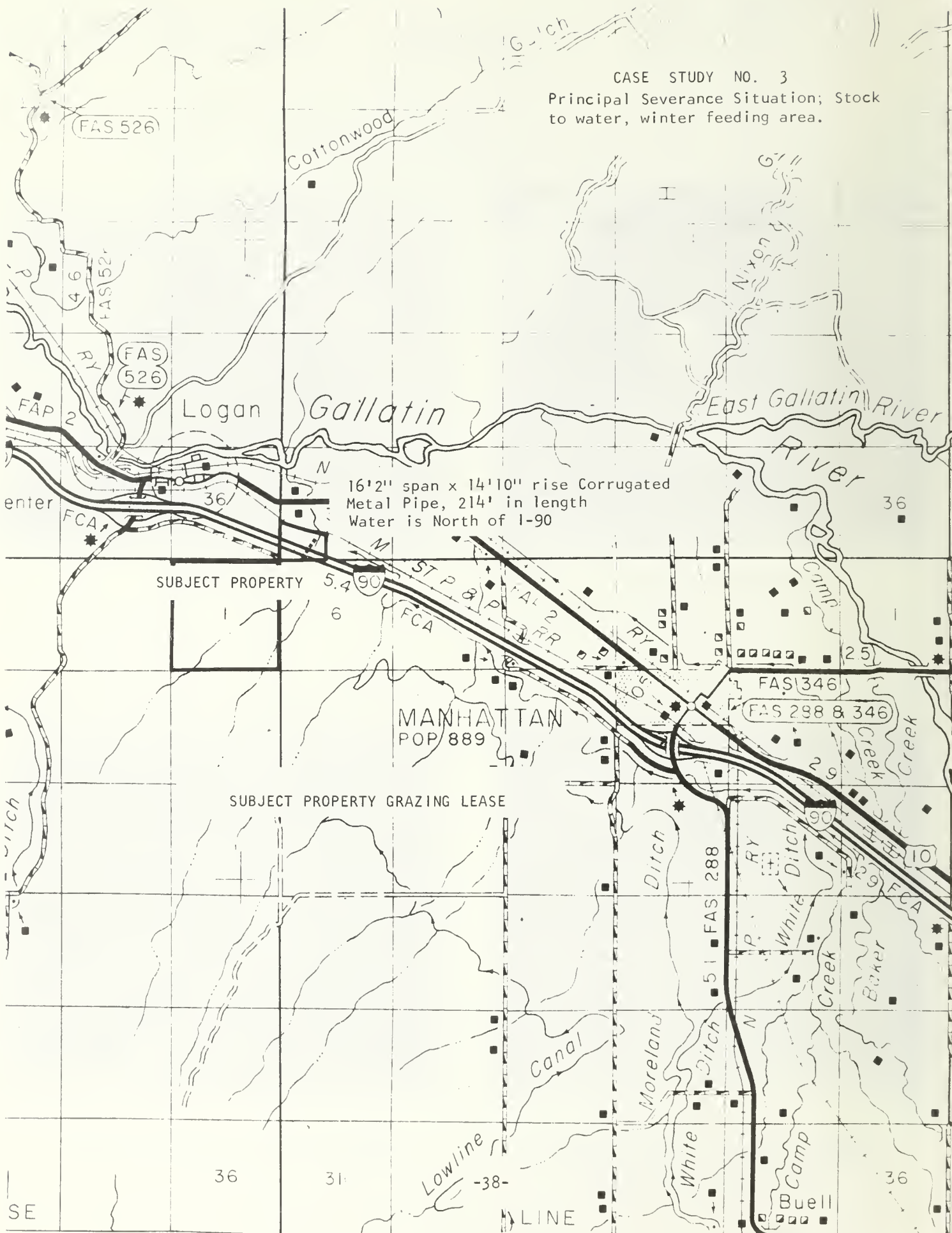


Looking North from NORTH ENTRANCE
Warm water springs area



Looking South from SOUTH ENTRANCE

CASE STUDY NO. 3
 Principal Severance Situation; Stock
 to water, winter feeding area.



SUBJECT PROPERTY

SUBJECT PROPERTY GRAZING LEASE

MANHATTAN
 POP 889

FAS 346
 FAS 288 & 346

FAS 288

36

31

-38-

36

SE

LINE

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 6 Controlled access

DATE OF INSPECTION: July, 1970

PRINCIPAL SEVERANCE SITUATION: Separated summer pastures.

TYPE OF OPERATION: Cow-calf with about 265 animal units total. 2,423 acres of grazing remain north and 940 acres of grazing and irrigated land south of I 90, along with main ranch unit. All lands are reasonably contiguous.

LOCATION: Headquarters are southwest of Whitehall on Route 287. Stockpass is 3 miles west of Whitehall on I 90 which is in Section 26, Township 2 North, Range 5 West, M.P.M., Jefferson County.

STRUCTURE TYPE: Arch corrugated metal pipe, 6'11" span x 8'6" rise, 262' in length with about 20' of fill. Pipe bottom is paved. Stockpass-drainage.

SPECIFIC PROBLEMS: This structure has been in use since 1966, or four seasons. It is primarily a summer pasture stockpass. Originally, the owner built a holding corral on the south side of right of way for driving herds through. Present owner has owned about ten years; originally had problems getting stock through. Two main problems exist: (1) His stock-trailing vehicle, or the jeep he uses to haul salt to the cattle, scrapes the side of the underpass occasionally. Another foot in width would have been adequate for this purpose. (2) The wing fencing above the concrete headwall causes problems in that the cattle can climb it and occasionally slip into the stockpass entrance, which can result in injury to cattle. Presently, there are about 2,423 acres of pastures north of I 90 and 940 acres of irrigated and meadow south of I 90.

This structure is in a drainage area as evidenced by the photos; physical inspection and landowner interview show this to be a good drainage-stockpass combination.

ADEQUACY: The structure is located in the best possible site, area was and still is a natural trail pass. Area north of underpass is grazing with water, area south is grazing and hayland. The physical condition of the approach is considered excellent, ground is on a level with entrances and free of trees, brush, etc. There is crested wheat planted on the road backslope and the terrain is open rolling area, level at both ends and pipe is clearly visible on both sides. Pipe bottom is paved and no deterioration. The rancher has not had to change his operation since construction of highway, and he has not sold or exchanged property since construction. Snow and ice are never a problem, and area is noted for its absence of snow. However, this would be primarily a summer use grazing area.

The owner said he couldn't operate without the underpass. He uses the interchange 3 miles west of his residence for any and all farm machinery movement. He is well satisfied with his present arrangement. It is 1.5 miles from the owner's residence to the stockpass and the interchange is 1.5 miles west of the stockpass.

REMARKS: One item of criticism is curable, the wing fencing directly into the stockpass instead of the present arrangement. The slight undersize for jeep usage is not curable. This stockpass is considered adequate for its intended and present use.

I IG 90-5 (4) Whitehall West
6'11" x 8'6" x 262' long Arch CMP



Looking South; objects in opposite end are cattle.



Looking north, note fencing.



Looking South from Pipe; note fencing as compared to opposite entrance.

Looking South from top of stockpass to show holding pens and cattle trail.



Looking North from stockpass to show usage and cattle trails.

Closeup of cement facing; owner states cattle climb this area and slip and fall





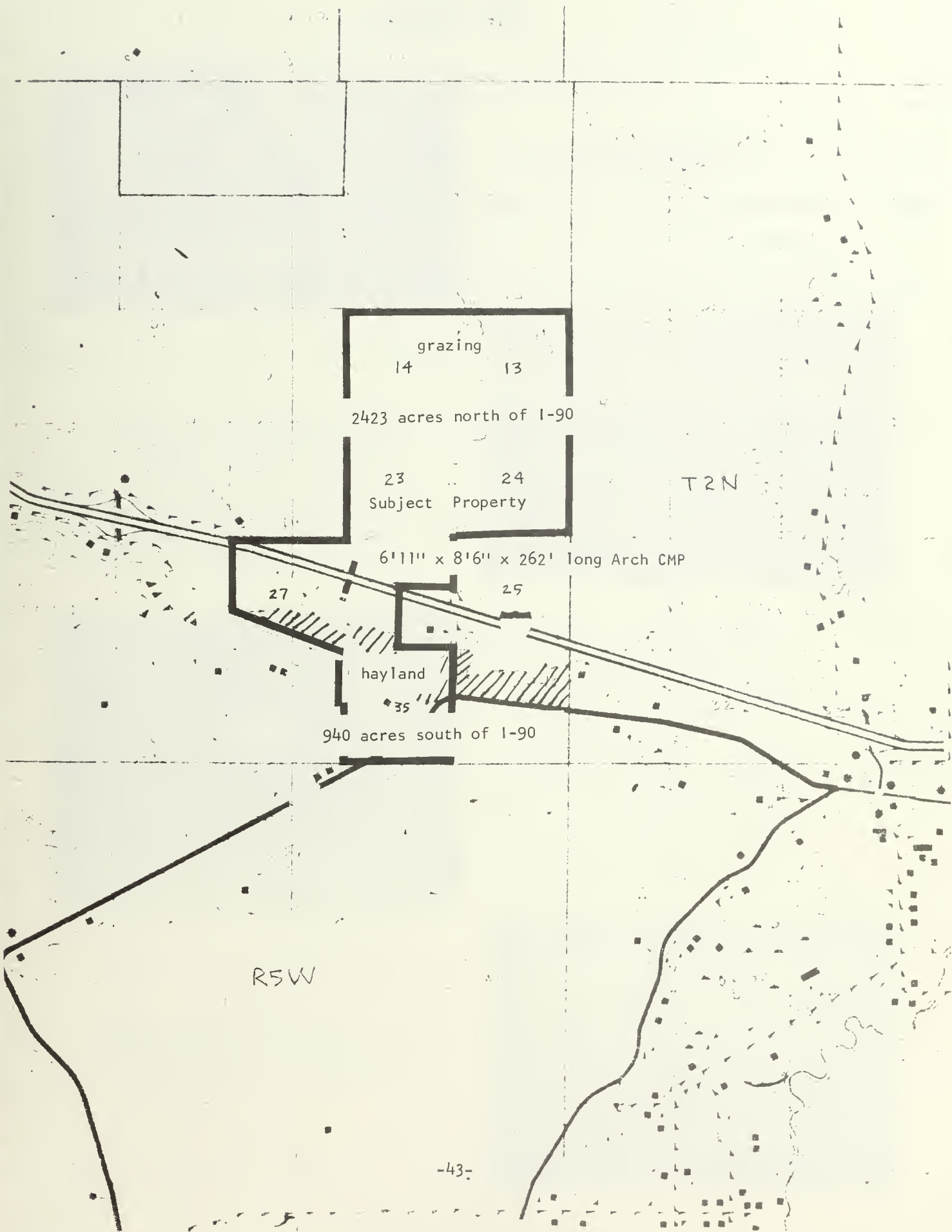
6'11' x 8'6' x 262' Long Arch CMP



90

R.R.

OLD
10



grazing
14 13

2423 acres north of I-90

23 24
Subject Property

T2N

6'11" x 8'6" x 262' Long Arch CMP

27

25

hayland

35

940 acres south of I-90

RSW

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 9 Controlled access
with a permissive right

DATE OF INSPECTION: July, 1970

PRINCIPAL SEVERANCE SITUATION: Small pasture separated from main unit.

TYPE OF OPERATION: Cow-calf - carries about 250 animal units on all contiguous lands.

LOCATION: About 9 miles east of Livingston in Section 35, Township 1 South, Range 11 East, M.P.M., Park County, Station 615+61 of F1-117(10).

STRUCTURE TYPE: 14' 3" Span x 8' rise, arch pipe 100' length. Flat location with about 3' of fill. Stockpass-drainage.

SPECIFIC PROBLEMS: This is a stockpass-drainage combination with good utility for both uses. It has a fair amount of usage, considering the limited amount of grazing and feed north of the right-of-way. Any farm machinery crosses at an interchange west of this ranch. The only problem is getting the cattle over the railroad tracks that parallel the highway once they are through the stockpass. The owner has 12 horses and states there is no problem in the usage of this stockpass. Snow is not a problem, but ice does cause a problem at entrances for about three weeks in February and March.

ADEQUACY: The owner stated that this stockpass serves its purpose. He is satisfied with the location, and it was his original choice. It serves all his stock movement needs. It has been in use ten years. There remains 100 acres north and 3,421 acres south. Actual dimensions are the same as the design measurements, showing no change. The metal pipe is still in good physical condition. This structure is considered adequate.

REMARKS: In situations where the highway parallels the railroad tracks, it might be well in some cases to channel stock from the stockpass over the railroad tracks by means of a wing fence and temporary gates across the tracks where permitted. This prevents stock scattering along the railroad right-of-way. It was originally intended as a joint usage structure with the adjoining landowner.



South End of Pipe

Looking South from Pipe



North End of Pipe

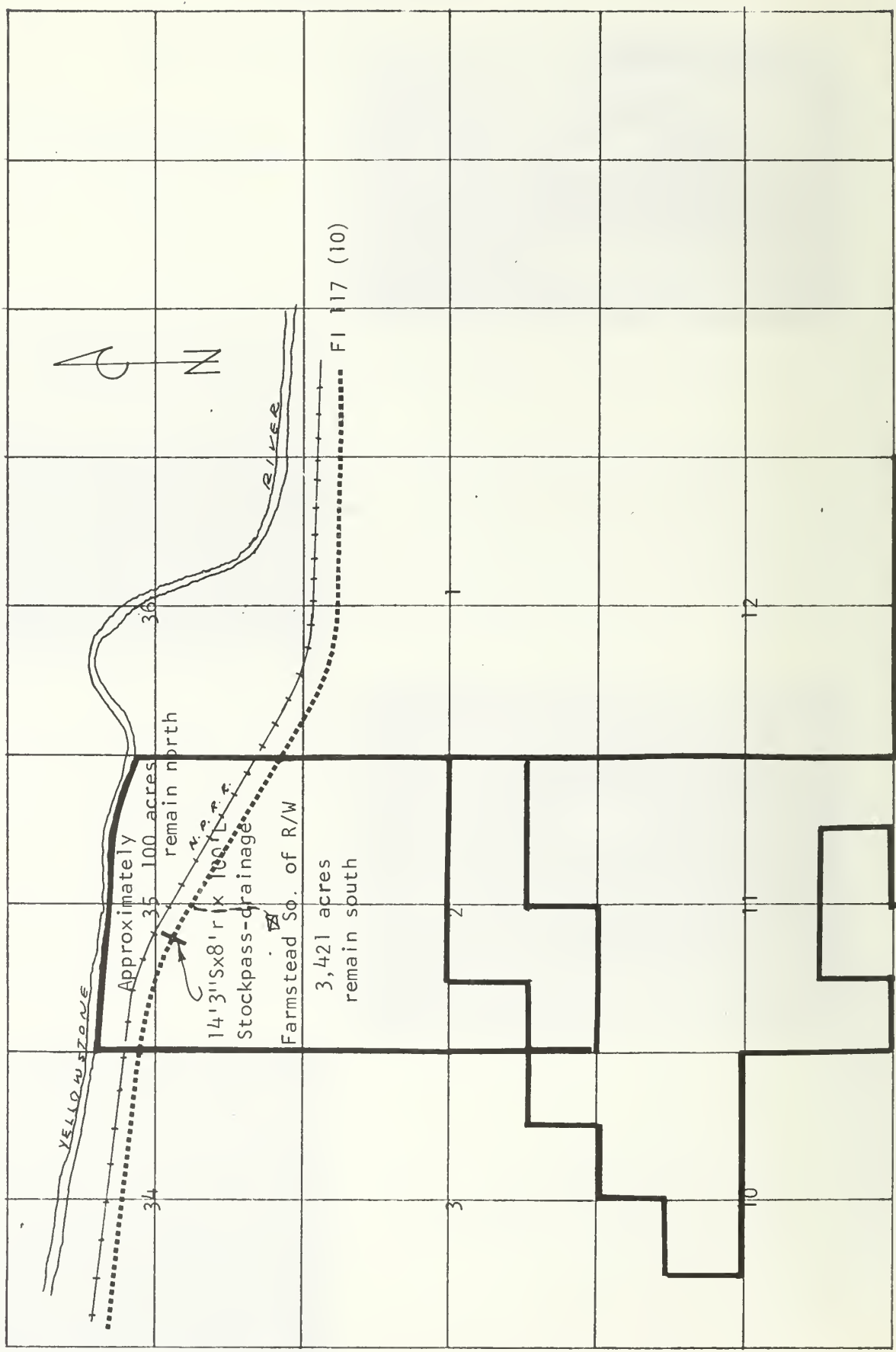
Looking North from Pipe
Railroad tracks in background



OWNERSHIP PLAT

SCALE 1" = 1/2 mile Principal Severance Situation Small pasture separated from main unit

DATE 8/70 CASE STUDY NO. 9 STRUCTURE AGE 10 years PROJECT NO. FI 117 (10)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 16 Controlled access DATE OF INSPECTION: July, 1970
 with a permissive right

PRINCIPAL SEVERANCE SITUATION: Meadow and creek separated from grazing pastures.

TYPE OF OPERATION: Cow-calf -- total about 100 animal units. 1,500 acres remain west of highway and 250 acres remain east of highway.

LOCATION: Five miles west of Livingston, Montana located in Section 17, Township 2 South, Range 9 East, Station 557+31 on Project FI 117 (10).

STRUCTURE TYPE: 84" x 68" in length, round corrugated metal pipe with 3' of fill. Actual dimension is 84". This is a combination stockpass-drainage.

SPECIFIC PROBLEMS: South entrance shows heavy collection of silt where north end shows less. The structure could stand some cleaning out. Ice is a problem some years.

ADEQUACY: The structure is adequate for its present use. The location is satisfactory also. However, when the Interstate is constructed, there will be problems to contend with. Replacement and location of frontage road, as well as re-evaluation of structure size will be necessary.

REMARKS: Trails show extensive usage of this 84" structure. The more the pipe becomes silted in, however, the harder it is to utilize for stock or horse movement.

84" x 68' Corrugated Metal Pipe



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE



NORTH ENTRANCE; Snow is about 2' deep, drifting alongside of entrance.



SOUTH ENTRANCE; Snow is about 2' deep, drifting to 6' adjacent to entrance.



Looking North from North End:
Snow is about 2' deep and drifting.

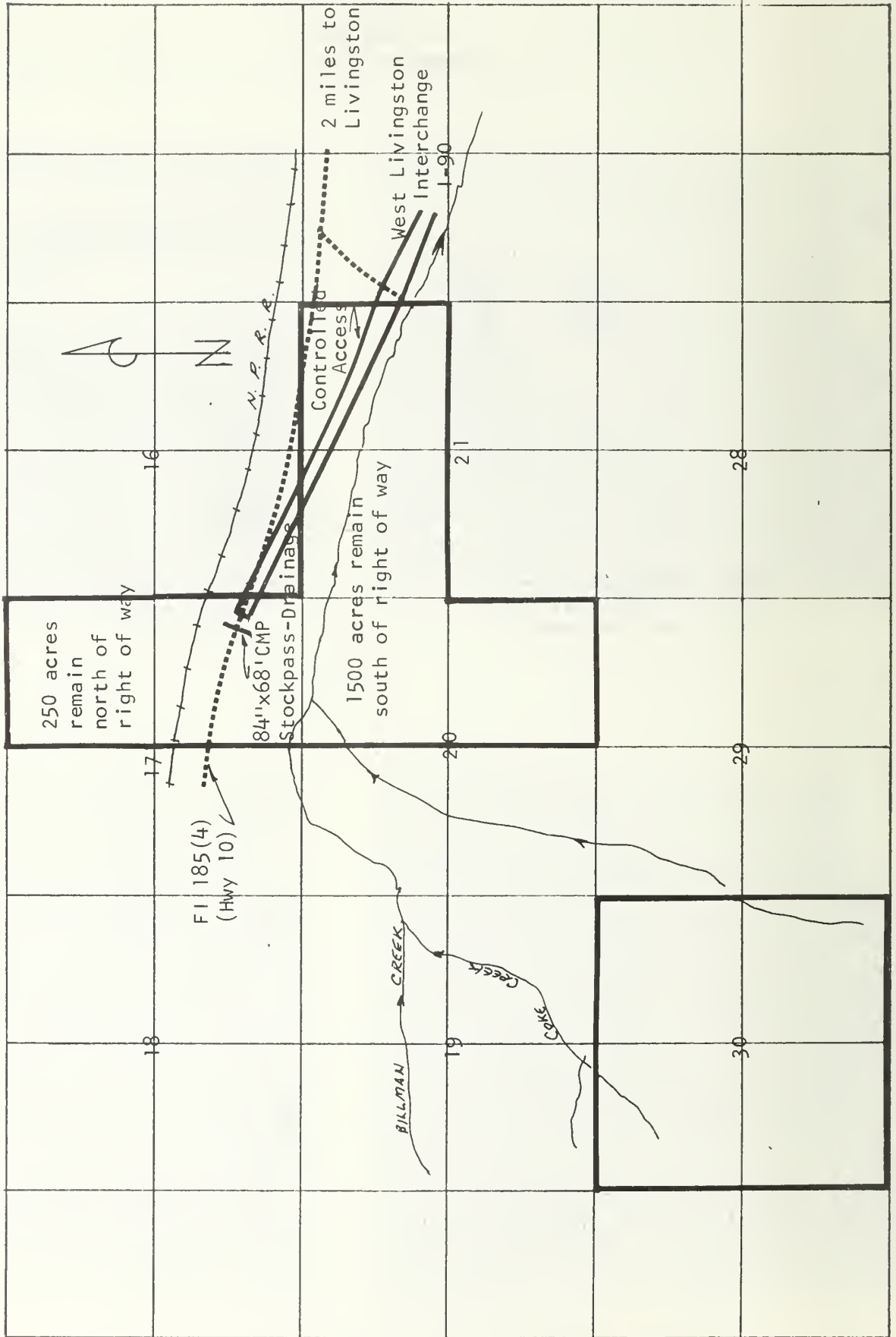


Looking South from South End:
Snow is about 2' deep and drifting.

OWNERSHIP PLAT

SCALE 1" = 1/2 mile Principal Severance Situation Meadow & creek separated from grazing pastures.

DATE 8/70 CASE STUDY NO. 16 STRUCTURE AGE 21 years PROJECT NO. F 117 (10)



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 17 Non-controlled access

DATE OF INSPECTION: July, 1970

PRINCIPAL SEVERANCE SITUATION: Separated grazing pastures; 600 acres remain north and 800 acres remain south.

TYPE OF OPERATION: Cow-calf -- about 175 animal units on contiguous lands. He also has a small feed lot operation and feeds calves into February.

LOCATION: Four miles west of Three Forks, located in Section 28, Township 2 North, Range 1 East, M.P.M., Broadwater County, Station 47+75 of FAP F 12 (6).

STRUCTURE TYPE: 156" diameter, round corrugated metal pipe, 154' in length, with 22 feet of fill material. This is a combination vehicle stockpass-drainage structure.

SPECIFIC PROBLEMS: No paved or graveled bottom in pipe. Originally, a narrow wooden floor was installed to conform with highway engineering design. This has since rotted out. Recently, a girl going through the underpass on horseback was seriously injured when the horse slipped on the slick bottom and fell on her. Also, it has the rough corrugations, making vehicular travel unsatisfactory.

ADEQUACY: The owner considers this good for stock and machinery usage, as well as adequate drainage-stockpass combination. With the exception of no pavement or gravel stabilization, the landowner considers the structure adequate for his present operation. He considers the location to be very good.

REMARKS: This stockpass has been in use since 1950. At that time, standards may have been different for stock installations. There is no justifiable reason why a corrugated metal pipe should not have surface material of some kind when considered as a stock or vehicular underpass. As the pictures show, this is gentle, rolling grassland, and drainage runoff does not appear to be heavy. Little silt can collect in a structure of that sort, and, therefore, natural bedding material will not collect.

FAP F 12 (6)
THREE FORKS WEST



EAST ENTRANCE
Looking West



WEST ENTRANCE
Looking East



Looking East from
EAST ENTRANCE



Looking West from
WEST ENTRANCE

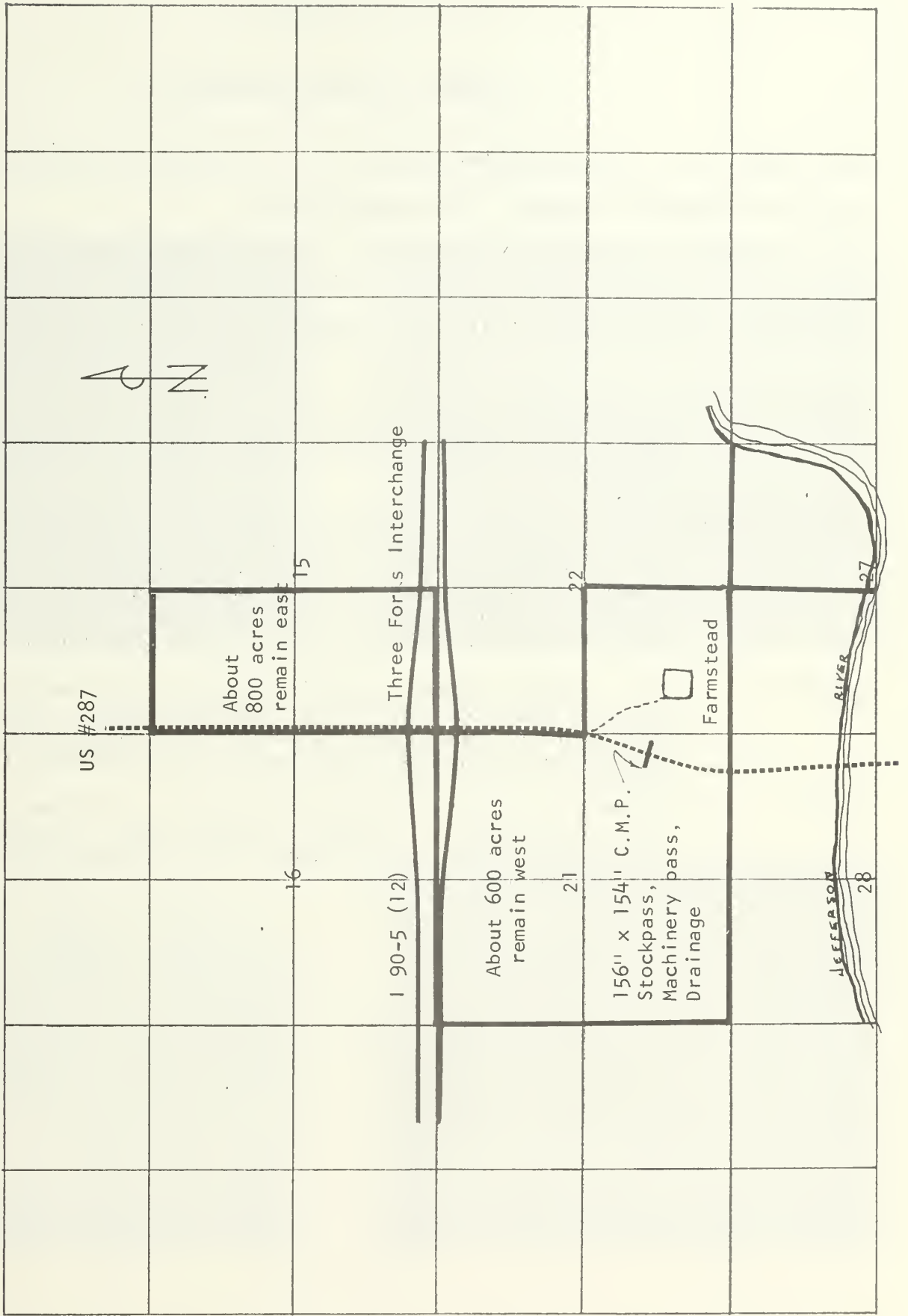
156" Diameter X 154' Length
Corrugated Metal Pipe with
22' of Fill

OWNERSHIP PLAT

SCALE 1" = 1/2 mile Principal Severance Situation Separated grazing pastures

DATE 8/70 CASE STUDY NO. 17 STRUCTURE AGE 20 years

PROJECT NO. FAP F 12 (6)



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 18 Non-controlled access

DATE OF INSPECTION: July, 1970

PRINCIPAL SEVERANCE SITUATION: Separated haylands

TYPE OF OPERATION: Cow-calf and yearling -- about 100 cow units and 90 yearling units.
25 acres remain north of highway, and 2,293 acres remain south of highway.

LOCATION: 12 miles east of Livingston, located in Section 5, Township 2 South, Range
12 East, M.P.M., Park County, Station 788+00 on Project I 90-7 (21) PE.

STRUCTURE TYPE: 14' 3" Span x 8' 11" Rise, 132' in length, with about 10' of fill to
top of roadbed. Actual measurements are the same as the designed mea-
surements. This was intended for stock usage. Actual usage includes
drainage.

SPECIFIC PROBLEMS: Ice was one of the major problems, depending on season and condi-
tions. If they put gates or blocked one end of the stockpass in winter-
time, snow did not fill in stockpass, allowing earlier usage. He can-
not move hay machinery through, and must cross over the highway.
Drainage is a problem because the stockpass is at a very low elevation.
Future four-lane construction will alter the situation.

ADEQUACY: Landowner says it is adequate for livestock, but not for haying machinery.
Location factors are considered as good as possible. The structure
has been in use since 1962, but would have to be considered conditionally
adequate for its intended usage because of ice and snow conditions limit-
ing usage.

REMARKS: Although this structure was intended to serve as a stockpass only, it serves
also as drainage, and it appears vehicular usage is desirable also.
Because it is located on low meadowland, it is only natural to expect
drainage runoff.

I 90-7 (21) (PE)
LIVINGSTON - BIG TIMBER

14'3" X 8' 11" X 132' in length
Arch Corrugated Metal Pipe



NORTH ENTRANCE



SOUTH ENTRANCE
Grade Crossing at Left



Looking North from
NORTH ENTRANCE

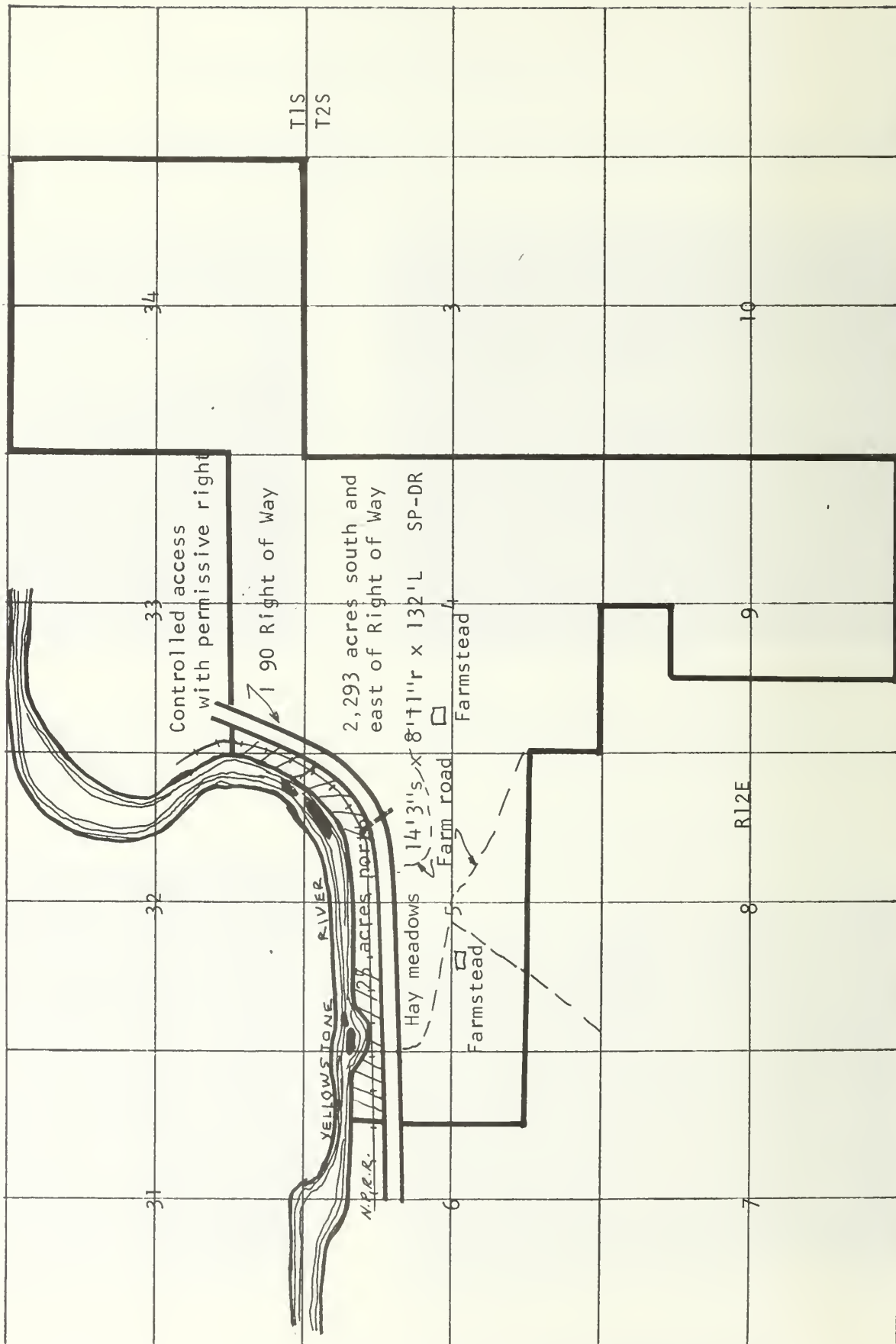


Looking South from
SOUTH ENTRANCE
Note: Road in background

OWNERSHIP PLAT

SCALE 1"=1/2 mile Principal Severance Situation Separated hay meadows.

DATE 8/70 CASE STUDY NO. 18 STRUCTURE AGE 11 years PROJECT NO. 1 90-7 (21) PE



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 20 Controlled access
 with a permissive right

DATE OF INSPECTION: July, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters separated from pasture and haylands,
 approximately 267 acres remain north, and 180 acres south.

TYPE OF OPERATION: Cow-calf -- approximately 52 animal units.

LOCATION: Six miles east of Livingston, located in Section 29, Township 1 South,
 Range 11 East on Project F1 117 (10), Station 441+80.

STRUCTURE TYPE: 16' 2" Span x 14' 10" Rise, 116' in length, corrugated metal arch
 pipe with about 6' of fill. Actual measurements 16' 2" Span x 14' 3"
 Rise. Vehicle, stock, and drainage usage.

SPECIFIC PROBLEMS: None stated or indicated by field investigator or landowner,
 except that cattle were hard to move through when this was new, but
 after a short time, it was no problem.

ADEQUACY: This is considered adequate by landowner for vehicle, stock, and drainage-
 stockpass combination. There is little or no deterioration to the
 structure, and it has been in use since 1960. Maximum height of clear-
 ance for a loaded truck is 12' 0".

REMARKS: If the structure had been moved one-fourth mile west, the south approach
 would be better. The present south approach is on a slight grade.

LIVINGSTON-EAST



SOUTH ENTRANCE
looking North



NORTH ENTRANCE
looking South



Looking South from
SOUTH ENTRANCE



Looking North from
NORTH ENTRANCE

16'2" Span X 14'10" Rise X 116' Length
Arch Corrugated Metal Pipe



SOUTH ENTRANCE; about 1' of snow;
some drifting about 50' south of
entrance. Evidence of light vehicular
traffic.



NORTH ENTRANCE; about 1' of snow



Looking South from SOUTH ENTRANCE
Heavy Snow on Meadow

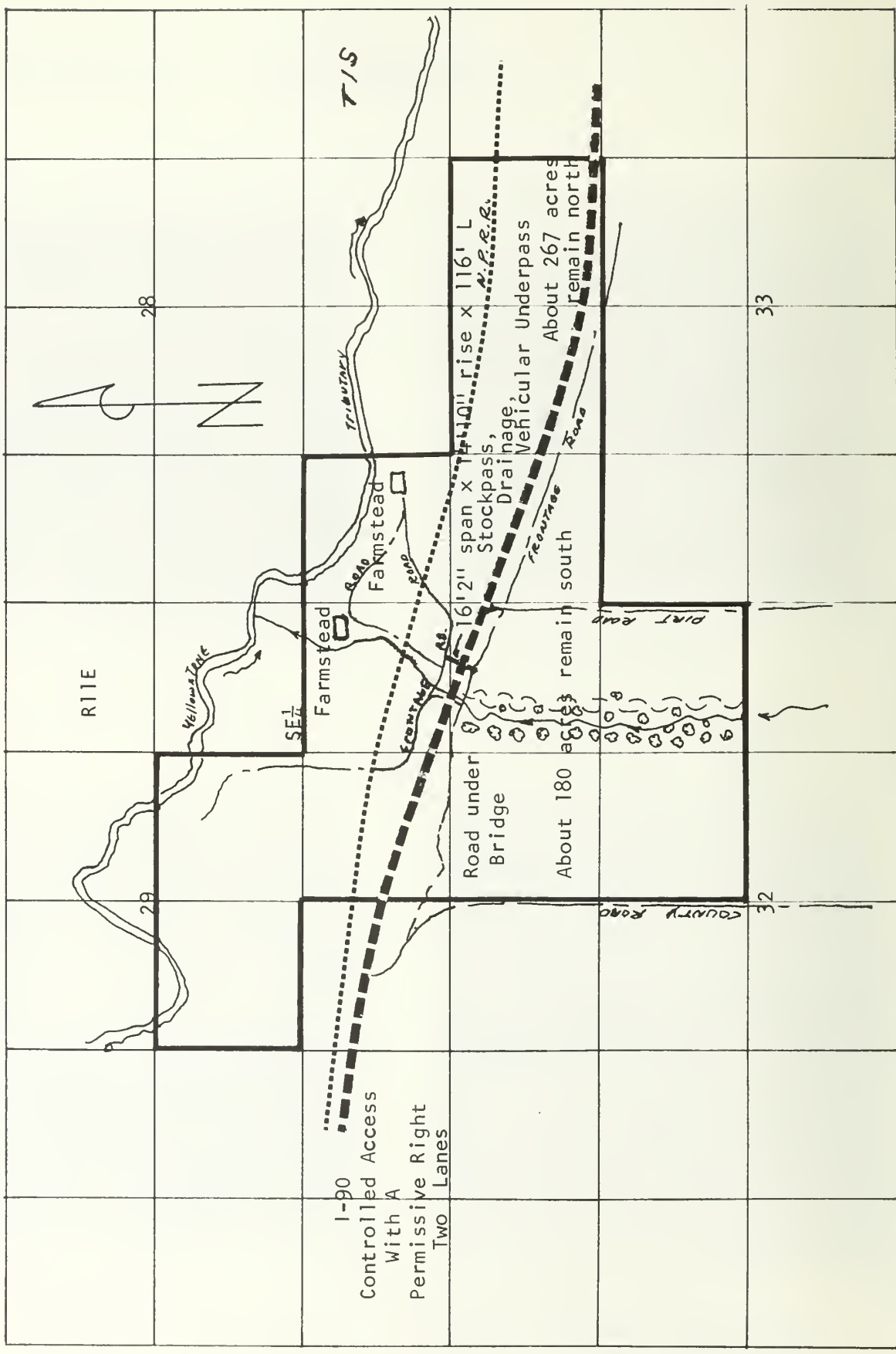


Looking North from NORTH ENTRANCE;
some drifting about 70' north.

OWNERSHIP PLAT

SCALE 1"= $\frac{1}{4}$ mile Principal Severance Situation Headquarters separated from pasture & haylands

DATE 8/70 CASE STUDY NO. 20 STRUCTURE AGE 10 PROJECT NO. FI-117 (10)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 21 - Non-Controlled Access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters and winter pasture separated from summer pasture.

TYPE OF OPERATION: Cow-calf -- 65 actual animal units. 300 acres remain north and 1,100 acres remain south of right-of-way.

LOCATION: Eight miles west of Livingston, Montana, located in Section 18, Township 2 South, Range 9 East, M.P.M., Park County, Station 475+00 on Project FAP 185 (3).

STRUCTURE TYPE: 84" diameter x 62' long, round corrugated metal pipe with 5' of fill, actual measurement is 84". Stockpass - drainage.

SPECIFIC PROBLEMS: None evident or stated by landowner.

ADEQUACY: The owner believes this underpass is adequate for all their operations; location is good, within eyesight of residence as stated by landowner. It has been in use since about 1949. Probably because of the short length of this pipe, little difficulty has arisen from the use of it. The landowner has a grade crossing for machinery. Cattle do not hesitate to use the structure.

REMARKS: It is located on level terrain, no backslope erosion and lots of good grass to stabilize the drainage areas. It might suggest reseeding near some structures that have drainage erosion in the vicinity of the stockpass-drainage area.

FAP 185(3)
LIVINGSTON WEST



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

84" x 62' Round Corrugated Metal Pipe



NORTH ENTRANCE; about 2' of snow
on level with drifting at entrance.



SOUTH ENTRANCE: drifting severe.



Looking North from NORTH ENTRANCE
Deep snow at entrance



Looking South from SOUTH ENTRANCE
Snow about 2' on level, drifting at
entrance.

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 23 Controlled access
 with a permissive right

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Community underpass - main usage of the interchange underpass is by a grazing association.

TYPE OF OPERATION: Cow-calf -- approximately 4,500 animal units use this interchange area and a stockpass farther south for the approximately 59,000 acres. It is all public land except for one section. For severance, see plat.

LOCATION: Ten miles south of Lima, located in Section 17, Township 14 South, Range 7 West, M.P.M., Beaverhead County, Station 2888+20 of I NG 355 (9).

STRUCTURE TYPE: 17' 2" Span x 15' 8" Rise, arch corrugated metal pipe, 136' in length, with $3\frac{1}{2}$ ' of fill to top of roadbed. This is an interchange structure. Actual measurements are the same as design measurements.

SPECIFIC PROBLEMS: Legal width and height for the State of Montana is 8' x 13' 6". If we measure 4' from the centerline and measure from the paved surface of the structure, we have a dimension of 14' 10". It would appear this would be sufficient clearance to allow a van or any stock truck clearance. Upon inspection and investigation, the truckdrivers of the large vans do not drive through this underpass. Whereas it might have been intended for local use, there is some indication that highway vehicles use the interchange for a turn-around area. There are definite marks on the structure as evidence of this, at about the 11' to 14' height on the west end. Apparently, now the trucks make a U turn instead of trying to maneuver the underpass.

ADEQUACY: The structure itself is more than adequate for any usage - it is the proximity of the access roads that causes any inadequacy. Location is suitable, and the structure has been in use 5 years. Semi-trailers cannot navigate the underpass from the access roads. Size is sufficient; however, entrance and exit designs possibly have an inadequate turning radius. They have trailed as many as 1,000 head through at a time, but the chairman of the grazing association says 500 head at one time is a large enough herd to allow good movement of cows and calves. According to authorities, these junior interchanges are no longer being designed.

REMARKS: Structure may or may not be adequate as an interchange structure. The turning radius of all trucks would have to be considered for the "on" and "off" ramps on the west side, the way it is at present.

17'2" span x 15'8" rise x 136' in length



EAST ENTRANCE



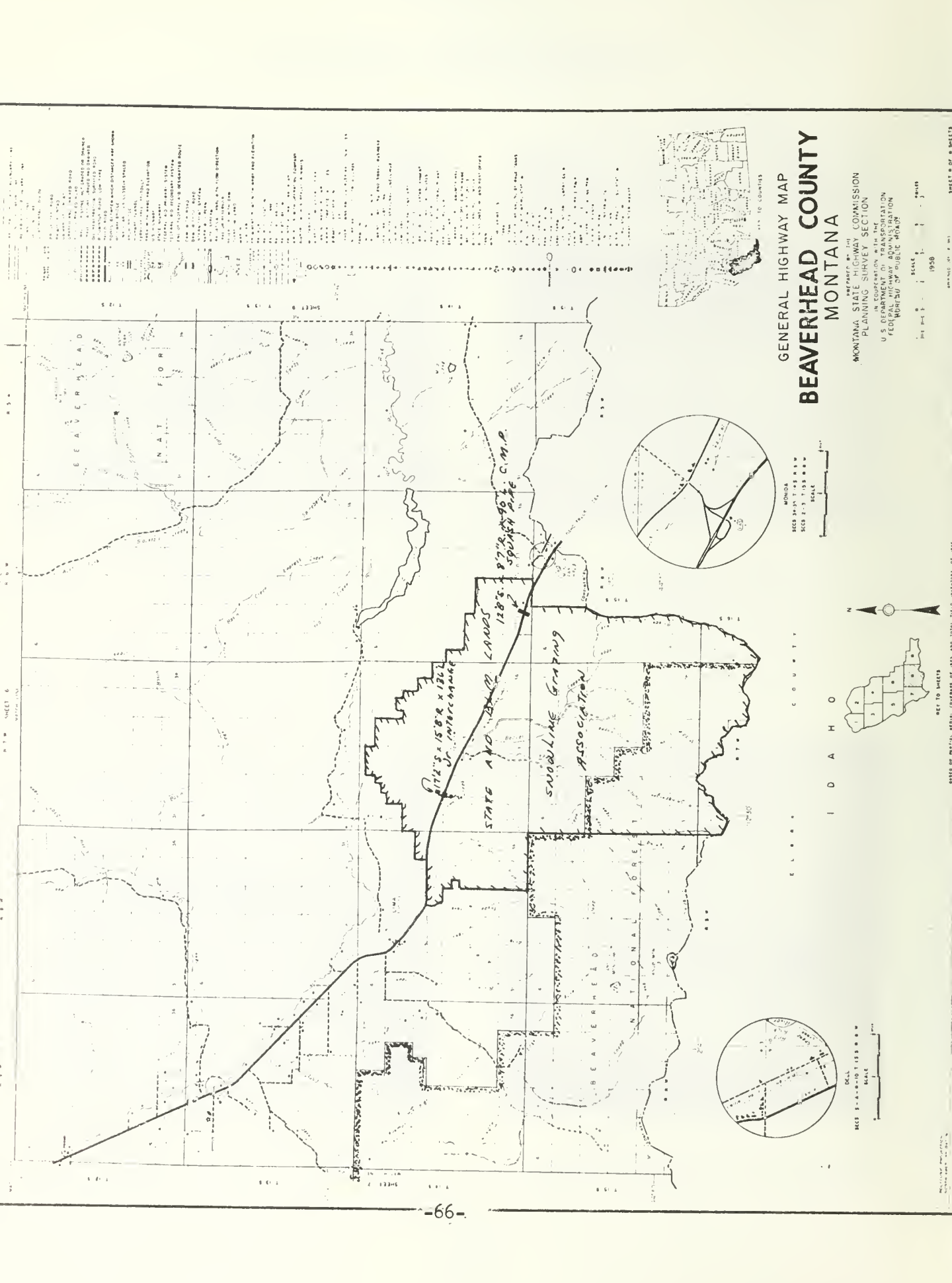
WEST ENTRANCE



Looking East from EAST ENTRANCE



Looking West from WEST ENTRANCE



GENERAL HIGHWAY MAP BEAVERHEAD COUNTY MONTANA

REPORT NO. 102
MONTANA STATE HIGHWAY COMMISSION
PLANNING SURVEY SECTION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

SCALE: 1" = 1 MILE
1956

SCALE: 1" = 1 MILE
1956



SCALE: 1" = 1 MILE
1956



BASED ON MATRIAL SERIAL COVERAGE OF 1935 AND 1938 FIELD SURVEY OF 1946

SEE TO SHEETS

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 24 Non-controlled access DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Separated summer grazing pastures.

TYPE OF OPERATION: Cow-calf -- approximately 4500 animal units use this grazing area and the interchange farther north on approximately 59,000 acres. It is all public land except for one section. For severance, see plat.

LOCATION: Sixteen miles south of Lima, located in Section 32, Township 14 South, Range 6 West, M.P.M., Beaverhead County, Station 3222 of I NG 355 (9).

STRUCTURE TYPE: 12' 8" Span x 8' 7" Rise x 90' in length, squash corrugated metal pipe, 5' of fill on pipe. Combination stockpass-drainage.

SPECIFIC PROBLEMS: Structure is much too small for large herd drives. Thirty individual ranchers belong to the Snowline Grazing Association and drive as many as 500 head at a time. It becomes a very boggy area during periods of runoff, and, although this provides bedding for the pipe, the soil does not contain enough gravel to keep a firm foundation.

A major item to keep in mind is that this grazing association was not at its present size and operation when the structure was built. This was built to accommodate the many users in the area who had grazing leases. The stock trail is on a separate easement southwest of the right-of-way and, therefore, was intended to accommodate large numbers. In contrast, the metal squash pipe was not large enough to handle the herds that were moved to pasture north and east.

ADEQUACY: Inadequate due to undersize and large volume of cattle usage. A larger arch pipe would have necessitated a raise in grade at that point. Stabilization of the pathway may have been possible with gravel or pavement.

REMARKS: Due to the large number of users and type of cattle operations in the area, it would seem necessary to provide an adequate structure. The stock lane seems to be of adequate width to accommodate the herds, and it would be consistent to provide an adequate underpass to connect the stock trail to the large public grazing lands. There is, however, highway access provided on the west side of the right-of-way. See Case Study No. 23 for analysis of the interchange structure in use by this grazing association.

12'8" span x 8'7" rise x 90' in length



EAST ENTRANCE; water and mud backs up beyond entrance.



WEST ENTRANCE; water collects and area becomes a quagmire of mud. Very poor drainage.



Looking east from EAST ENTRANCE; water flows from East to West



Looking west from WEST ENTRANCE; note length of low condition.



Looking west to northwest from WEST ENTRANCE; note stock reservoir in background.



Looking west to northwest from WEST ENTRANCE; stock trail to this pass parallels the railroad.

Stockpass snow conditions; Monida
Pass, Elev. 6800. 5/12/70



WEST ENTRANCE



EAST ENTRANCE

12'8" span x 8'7" rise x 90' in length
Corrugated Metal Pipe



Looking west from WEST ENTRANCE



Looking east from EAST ENTRANCE

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 30 Controlled access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters from cultivated land.

TYPE OF OPERATION: Cow-calf; approximately 500 animal units with about 6,776 acres remaining north of right-of-way, and 800 remaining south.

LOCATION: About 12 miles east of Drummond, located in Section 19, Township 10 North, Range 11 West, M.P.M., Granite County, on Project I 90-3 (1), Station 2081+63.

STRUCTURE TYPE: 16' Span x 12' Rise x 123.5' concrete bridge, box-shaped. Top of structure is roadway grade. Actual measurement is 16' Span x 11' 4" Rise.

SPECIFIC PROBLEMS: The landowner sometimes has trouble with calves; deck leaks, causing an ice problem at times. Very minor problems. He would like greater height. No snow problems mentioned.

ADEQUACY: The user considers this very satisfactory; it is adequate, and the location is ideal. It has been in use in 1960. As mentioned above, the landowner would like greater height. The majority of his land lies north of I 90; however, the cultivated fields are on the river bottom. Hay machinery, hay trucks, would be the largest machinery using this structure. Stack retrievers and swathers use this apparently without difficulty. 500 cattle go through twice a year. No major changes were necessary to the livestock or haying operation, no new machinery was necessary due to construction of I 90. This structure does not have a concrete floor.

REMARKS: The conclusion is: This is a very usable structure, and recommendations would be only to make sure roadways in and to these structures are as adequate as the structure. It is in this case, however, there apparently was some crack at the joint of the bridge deck to allow seepage into the structure. If it were a road surface problem, this would normally come under the Highway Maintenance Division, and eventually be repaired.

I 90-3 (1)
DRUMMOND EAST

16' Span X 12' Rise X 123.5' Length
Concrete Bridge-type Box



NORTH ENTRANCE



Looking north from NORTH ENTRANCE



Looking south from SOUTH ENTRANCE



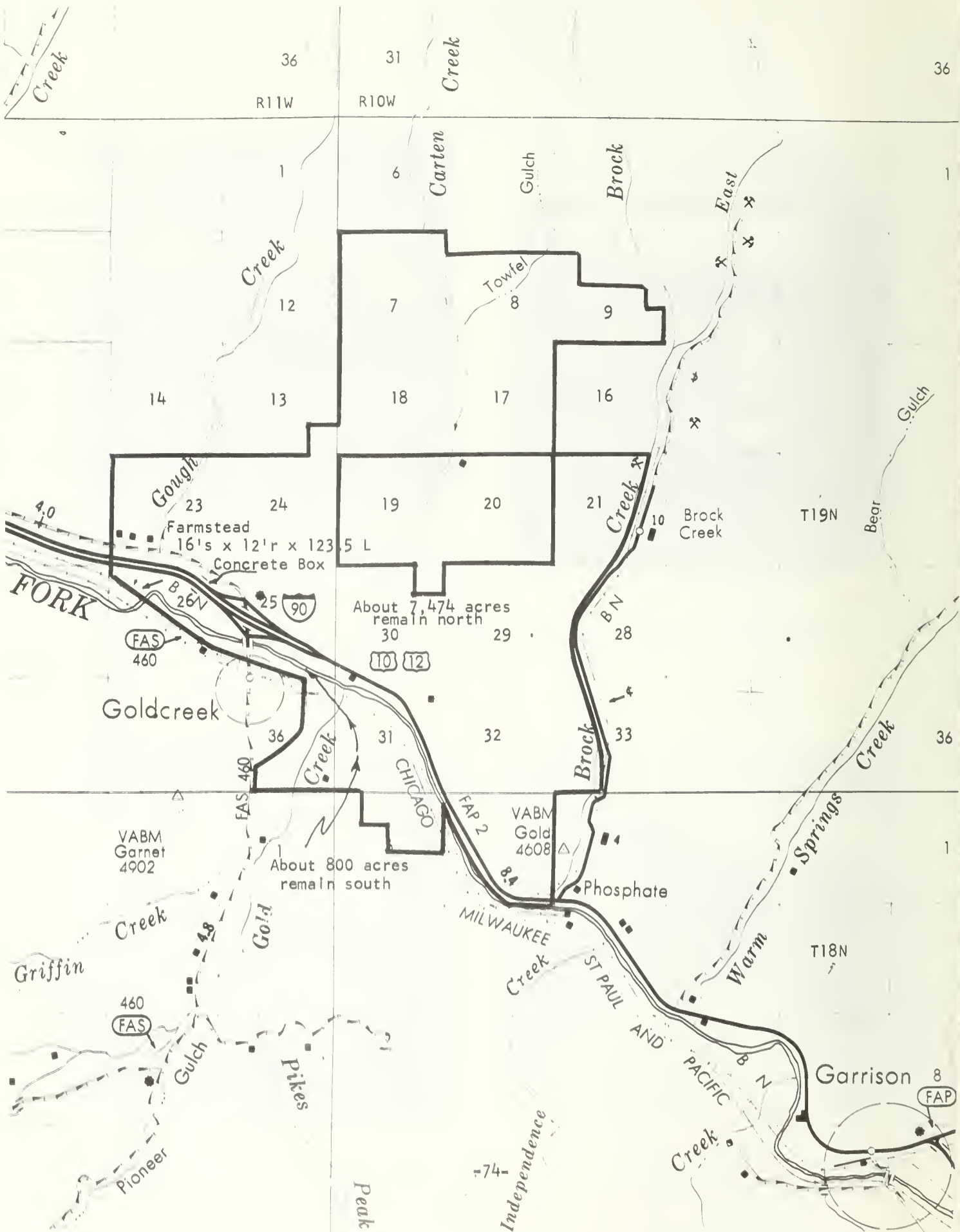
SOUTH ENTRANCE



Looking south from top of Pass



Looking north toward owners' residence



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 31 - Controlled Access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Separated hayland and grazing; also winter feeding area separated from headquarters.

TYPE OF OPERATION: Cow-calf; about 600 animal units. He also has a feeder operation; note loading pens in photographs. 9,200 acres remain north of right-of-way and 200 acres remain south.

LOCATION: 8 miles east of Drummond, located in Section 19, Township 10 North, Range 11 West, M.P.M., Custer County, Station 2114+40 on Project I 90-3 (1).

STRUCTURE TYPE: 16' span x 12' rise x 123.5' concrete bridge; box-shaped top of structure is roadway grade and actual measurement is 16' x 11'7". Stock and vehicular underpass.

SPECIFIC PROBLEMS: None evident or stated.

ADEQUACY: Landowner considers it adequate and in good location. He is well satisfied and does not have to dismantle any machinery to go through the pass. Cattle go through the structure without any effort. No major changes in operation since construction of I 90. This structure does not have a concrete floor.

REMARKS: One can only conclude this structure serves the purpose for which it was intended. The fact it is less than legal height might be an indication that it is not "superadequate". Most ranches will, at times, have a truckload of hay at least 12' in height.

As to recommendations, again it is important to stress the value of good surface areas on approaches and bed of structure. It is only natural to expect adequate surfacing with an adequate structure. There is good drainage in this instance, and the roadway approaches and surfacing are very adequate.

16' Span X 12' Rise X 123.5' in length
Concrete Brige; Box-type Structure



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE



Looking South from Top of Pass



Looking North from Top of Pass

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 32 Controlled access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Separates winter feed areas from headquarters.

TYPE OF OPERATION: Cow-calf and feeder operation, about 515 animal units.
Approximately 1200 acres remain north, and 200 remain south.

LOCATION: About 6 miles east of Drummond, located in Section 23, Township 10 North,
Range 11 West, M.P.M., Granite County, Station 2326 on I 90-3 (1).

STRUCTURE TYPE: 16' Span x 12' Rise x 123.5' in length. Concrete bridge span,
box shape. Actual measurements are 16' span x 11' 8" rise. Stock
and vehicular underpass.

SPECIFIC PROBLEMS: Problems mentioned were that drainage was poor and that
closing the median opening made the stockpass darker. However, 2 of
3 landowners did not mention darkness to be a major deterrent in usage
of this underpass. This user also mentioned he had some trouble getting
cattle through because it was dark. This structure does not have a
concrete floor.

ADEQUACY: The landowner would like greater clearance to haul larger loads of hay.
He does not, however, have any machinery that will not pass through
the structure. It is considered in an ideal location. His operation
has not changed noticeably since highway construction. This is con-
sidered an adequate structure for the use for which it was intended.

REMARKS: It was a policy to close the highway medians on these box structures due
to the safety factor. This has been done on these structures within
the past two years. This would naturally tend to make the stockpass
darker; however, it would alleviate the major drainage problem.

One recommendation might be to prevent the pooling situations in the
underpass or at either end by providing adequate runoff catch-basins
during time of construction. This is not possible in every case.

I 90-3 (1)
DRUMMOND EAST

16' span x 12' rise x 123.5' long
Concrete Bridge, Box Shape



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 33 Limited access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters are separated from haylands.

TYPE OF OPERATION: Cow-calf and feeder, about 400 animal units. 50 acres remain north of right-of-way, and 4,950 acres remain south.

LOCATION: 11 miles west of Livingston, located in Section 6, Township 2 South, Range 12 East, M.P.M., Park County, at Station 719+00 of I 90-7 (21).

STRUCTURE TYPE: 14' 3" Span x 8' 11" Rise x 98' in length. Approximately 8' of fill to roadbed. Actual measurements are the same. Stockpass-drainage.

SPECIFIC PROBLEMS: Elevation of bottom of structure is too low - drainage becomes a problem. It is set in a flat location, also. The owner would like a gate near the stockpass to get the cows off the highway. They can climb between the post and culvert ends, and get onto the right-of-way. Drifting snow causes a problem, also.

ADEQUACY: Landowner considers the structure adequate for cattle usage, and in an acceptable location. Fencing is curable, drainage is probably not curable. It has been in use since 1959. The user has a grade crossing for machinery.

REMARKS: This structure was possibly set too low during construction. Conditions brought about by natural change may have caused this; for example, building up of topsoil by silting, overflow, or tilling. This would make the stockpass entrance lower than the surrounding terrain.

The wing fences can be attached to most corrugated metal pipes by stringing the wire from the pipe end bolt holes to the post.

Because there is only 50 acres of grazing aftermath north of the right-of-way, this was not intended as a cattle underpass only. Drainage was the primary consideration.



NORTH ENTRANCE



SOUTH ENTRANCE

14'3" span x 8'11" rise x 98' long
Corrugated Metal Pipe



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE



NORTH ENTRANCE; very little drifting;
about 18" of snow near entrance.



SOUTH ENTRANCE; very little drifting;
about 2' of snow near entrance.



Looking North from NORTH ENTRANCE; almost
1' of snow on level between stockpass
and railroad.



Looking South from SOUTH ENTRANCE;
little drifting, about 2' of snow on
level.

OWNERSHIP PLAT

SCALE 1"=1/4 mile

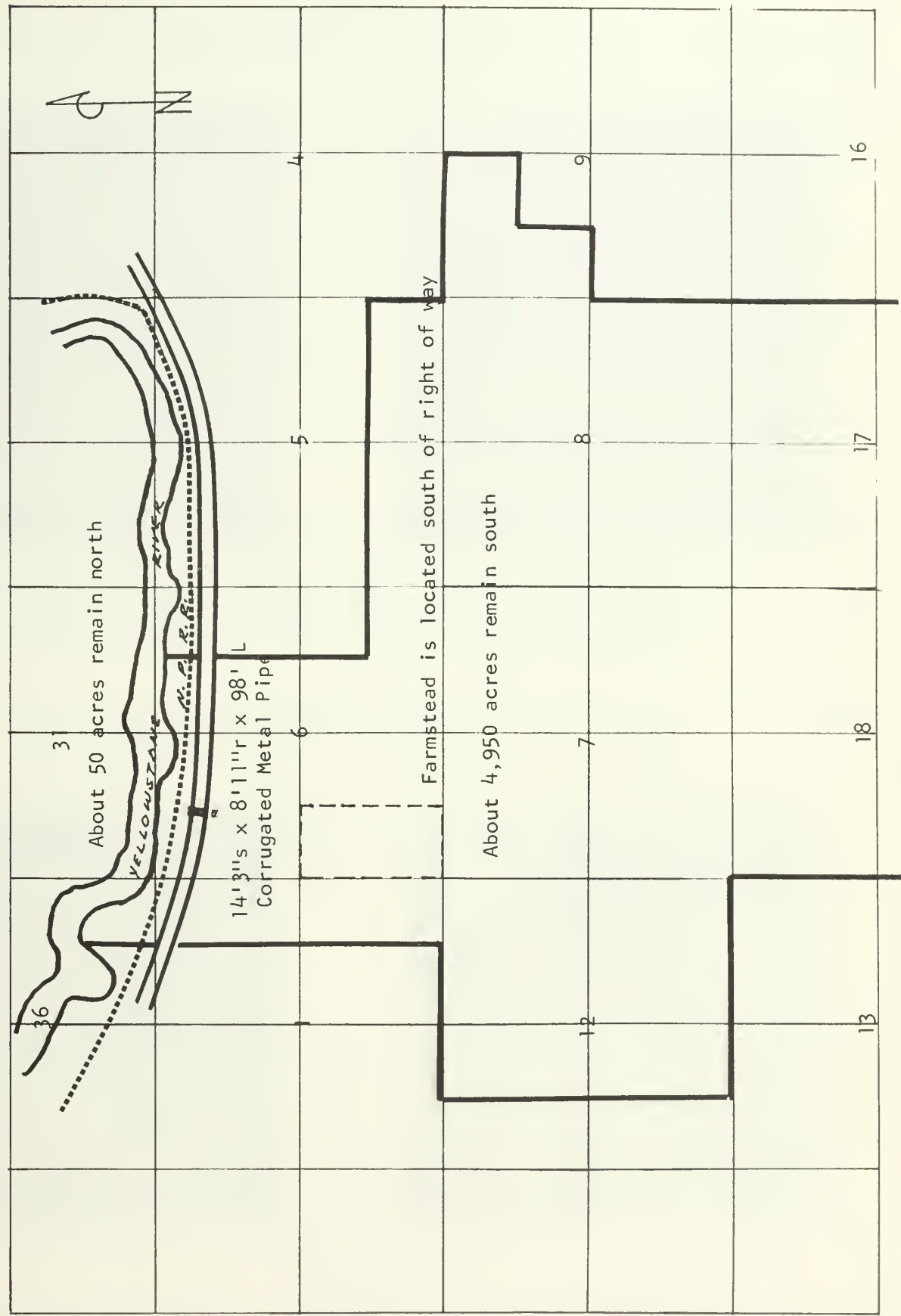
Principal Severance Situation Headquarters separated from hay meadows and river

DATE 8/70

CASE STUDY NO. 33

STRUCTURE AGE 11 years

PROJECT NO. 1 90-7 (21) PE



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 34 Controlled access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters separated from grazing land.

TYPE OF OPERATION: Cow-calf -- about 100 animal units; keeps a few calves over for feeders, 15% for replacement heifers. 5,000 acres remain east of I 15 right-of-way, and 3,000 acres remain west.

LOCATION: Eighteen miles north of Helena, located in Section 17, Township 12 North, Range 3 West, M.P.M., Lewis and Clark County, Station 725+00 on I 15-4 (1).

STRUCTURE TYPE: 15' 6" Span x 13' 10" Rise x 154' in length, arch corrugated metal pipe, 6' of fill to top of roadbed. Actual measurements are the same. This is a combination vehicle, Stockpass, and drainage structure.

SPECIFIC PROBLEMS: None evident or stated by owner. There apparently are no snow problems to speak of, except that approaches away from the pass sometimes drift in.

ADEQUACY: It is considered a very adequate stockpass, and in the best location in the owner's estimation. The owner has no problems with animals or machinery in the pass. In fact, a logging company has used the pass to move loaded logging trucks from the logging area onto the highway. His neighbor runs about 5,000 sheep twice a year through the underpass. The landowner has not had to change his operation due to construction of I 15.

REMARKS: This is a very well thought-out and designed structure for this operation from all available information. An easement was purchased through an adjoining ranch to connect the two non-contiguous parts.

The low carrying capacity of similar lands may complicate justification of underpasses on similar-sized cattle ranches. Each would, no doubt, have to be judged on its relative merits to derive the justification.

I 15-4 (1)
HELENA-NORTH

15'6" span x 13'10" rise x 154' long
Arch C.M.P.
Stockpass-vehicular-drainage



EAST ENTRANCE



WEST ENTRANCE



Looking East from EAST ENTRANCE

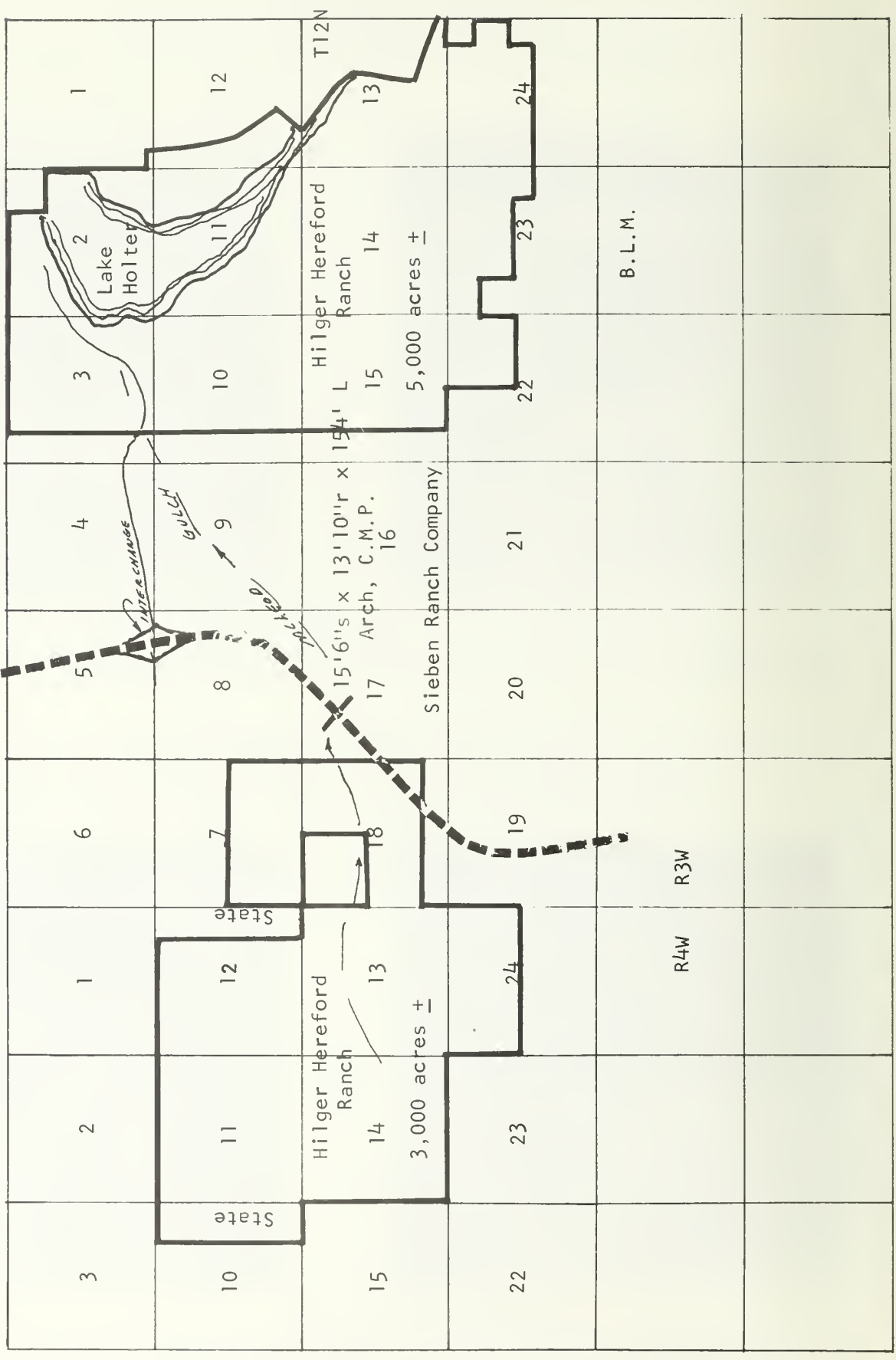


Looking West from WEST ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Headquarters & main unit separated from grazing lands

DATE 8/70 CASE STUDY NO. 34 STRUCTURE AGE 9 years PROJECT NO. 1 15-4 (1)



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 35 Controlled access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Access to mining claims; no principal severance to the landowner.

TYPE OF OPERATION: Mining

LOCATION: Five miles east and north of Butte, located in Section 15, Township 3 North, Range 7 West, M.P.M., Silver Bow County, Station 149+50 on I 15-2 (13).

STRUCTURE TYPE: Standard Drawing 59-04 of 1969, No. 192, which has a 16' 2" Span x 14' 10" Rise and is 120' in length, arch corrugated metal pipe. Actual measurement is 16' 4" Span x 14' 8" Rise.

SPECIFIC PROBLEMS: No one is using this particular structure, rendering it super-adequate for the present. It is primarily an access to mining claims east of I 15 right-of-way. Some snow plowed off highway gets into ends of pass.

ADEQUACY: Super-adequate for present use; anticipated future use is probably largest need to consider in mining areas.

REMARKS: These are very difficult situations to adequately analyze for land-use structure needs. When they are not located on public rights-of-way, only limited usage can be made of them legally. This does serve the purpose of access to mining claims, which apparently is not very often. This was originally installed to serve a mining development company which has since sold out to other interests. There now remain other claims which are accessible only by this structure, located on private property. Access east of right-of-way would have to be negotiated by subsequent buyers, whether one or several. Access rights to this underpass could be granted only by the original owner to the buyer. Subsequent buyers east of right-of-way would have to negotiate their own access through private land.

BUTTE NORTH

16'2" span x 14'10" rise x 120' long
Corrugated Metal Pipe



EAST ENTRANCE



WEST ENTRANCE

Intended for mining claim access.
Little or no use at present.



Looking East from EAST ENTRANCE

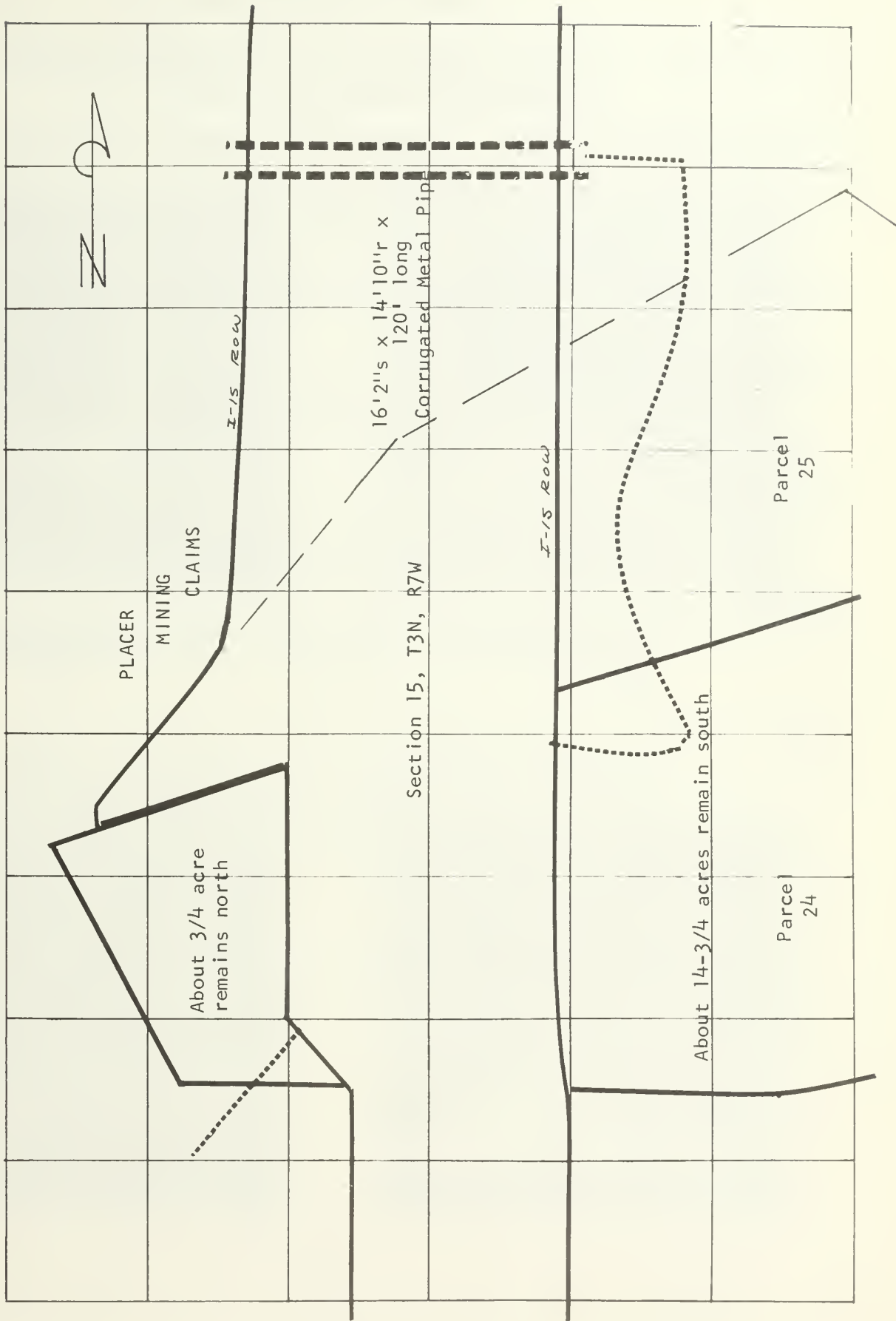


Looking West from WEST ENTRANCE

OWNERSHIP PLAT

SCALE 1"=100 ft. Principal Severance Situation Access to mining claims, was installed for one mining company

DATE 8/70 CASE STUDY NO. 35 STRUCTURE AGE 3 years PROJECT NO. 15-2(13)



13'10" rise x 11'9" span x 92' in Length
Corrugated Metal Pipe
Vehicle, stockpass and drain usage



EAST ENTRANCE



WEST ENTRANCE



Looking East from EAST ENTRANCE

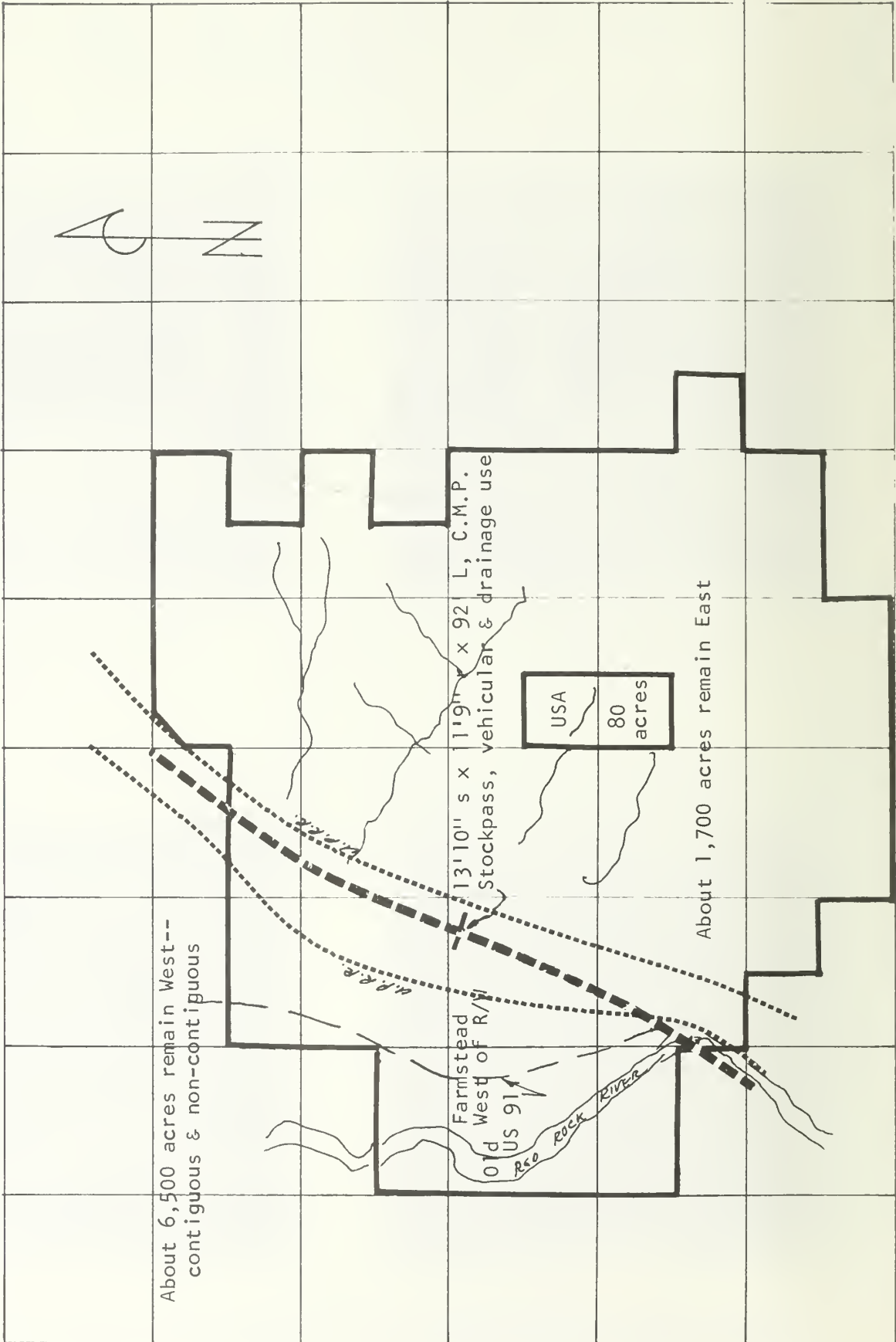


Looking West from WEST ENTRANCE

OWNERSHIP PLAT

SCALE $1'' = \frac{1}{2}$ mile Principal Severance Situation Headquarters separated from grazing land

DATE 8/70 CASE STUDY NO. 37 STRUCTURE AGE 4 yrs. PROJECT NO. I 15-1 (17)



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 39 Non-controlled access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters and cropland separated from grazing pastures.

TYPE OF OPERATION: Cow-calf -- about 200 animal units with 15% holdover of replacement heifers. Approximately 640 acres remain east of right-of-way and 2,502 acres remain west.

LOCATION: Thirty miles south of Ennis, located in Section 21, Township 10 South, Range 1 East, M.P.M., Madison County, Station 1019+50 of F244 (13).

STRUCTURE TYPE: 5' 3" Span x 7' 9" Rise x 80' in length, with about 4' of fill material. Actual dimensions are 5' 4" Span x 7' 6" Rise. Stockpass-drainage.

SPECIFIC PROBLEMS: Snow is an occasional problem on the east end due to the fact that the backslope is on a sharp angle (See photograph of east approach to pass). The landowner does not like the height, as it is not quite high enough to ride a saddlehorse through.

ADEQUACY: The landowner has a poor opinion of the underpass. He felt the old concrete box that this arch pipe replaced was a much better underpass. As described above, he cannot ride a saddlehorse through. This would have to be considered barely adequate for a ranch this size. It would have been better located one-quarter mile north of its present location.

REMARKS: It is fairly evident that the landowner does not find the underpass satisfactory. One natural reason would be the size of the ranching unit; it is what is normally considered an economic unit and is therefore a sizeable operation. Driving 200 head to summer pasture through this "Type B" underpass is difficult, and a larger underpass would be recommended for similar situations. He has to use a horse because a pickup will not go through. Also, it would require several men on this drive.

The east approach to this underpass, while graded and clean, is not a direct approach, and therefore, not as effective as a straight-on trail where cattle can see through to the other side. The steep sidehill prevents this, however. A 10' diameter stockpass would be the suggested alternate solution located one-quarter mile north.

Stockpass to ranch value ratio is 4.2% based on appraisal and cost estimates of 1968, date of project.

F 244 (13)
ENNIS-REYNOLDS PASS

5'3" span x 7'9" rise x 80' in length
Arch corrugated metal pipe, Type B



EAST ENTRANCE



WEST ENTRANCE



East approach to underpass

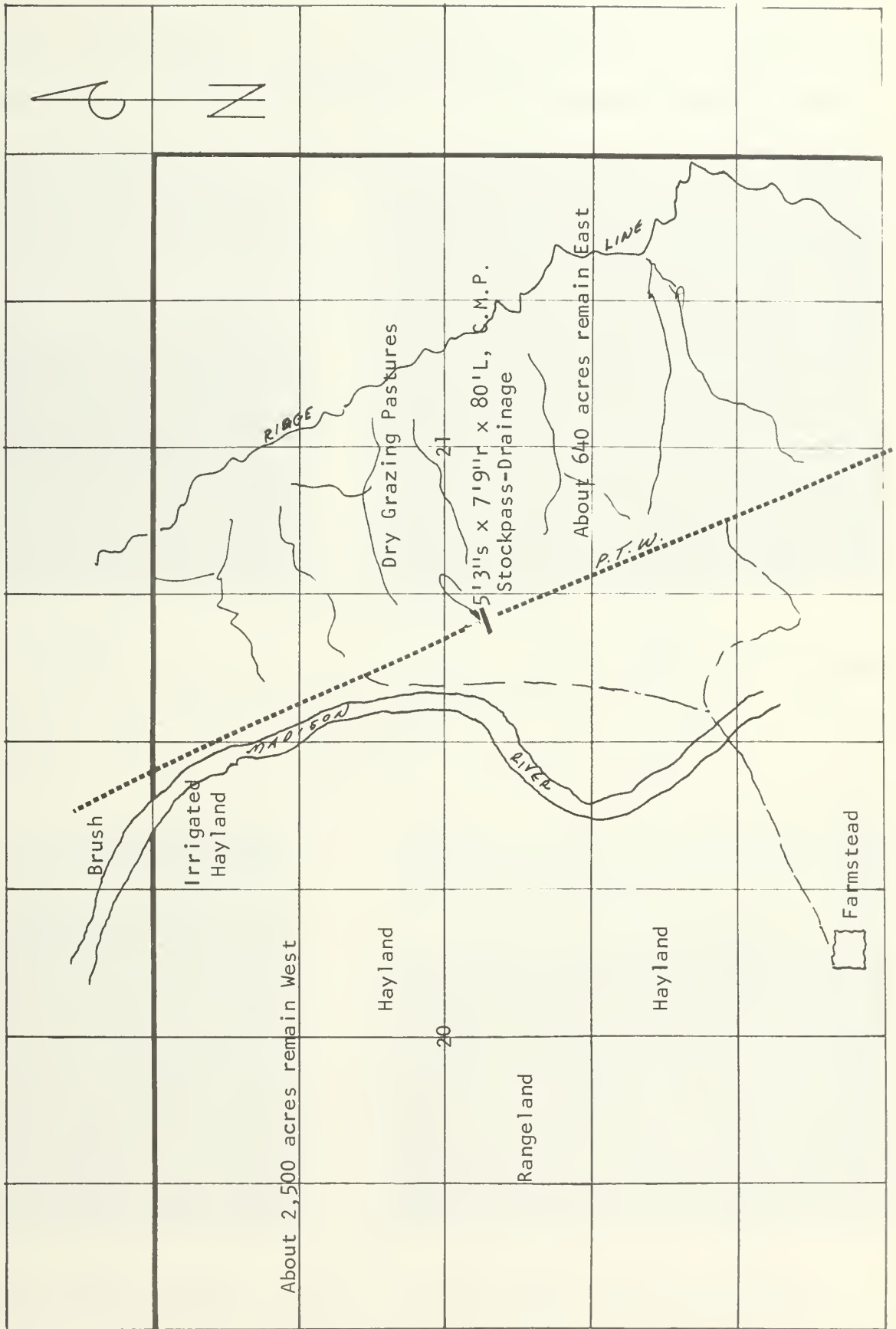


Looking West from WEST ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1/4 mile Principal Severance Situation Headquarters & cropland separated from grazing pastures

DATE 8/70 CASE STUDY NO. 39 STRUCTURE AGE 2 yrs PROJECT NO. F 244 (13)



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 40 Non-controlled access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Winter feeding area separated from headquarters.

TYPE OF OPERATION: Cow-calf --- about 100 animal units with 15% holdover for replacement. Approximately 250 acres remain north and 2,900 acres remain south.

LOCATION: Ten miles west of Big Timber, located in Section 9, Township 1 South, Range 13 East, M.P.M., Sweetgrass County, Station 1245+55 on Project F1 117 (10).

STRUCTURE TYPE: 9' 6" Span x 5' 7" Rise x 60' in length, squash corrugated metal pipe with about 6' of cover. Combination stockpass-drainage.

SPECIFIC PROBLEMS: Stock seems to prefer the north end over the south end. It appears to be a finer soil with some grass and mulch near the entrance. The south entrance is rocky gravel with some large boulders.

ADEQUACY: This structure is about fifteen years old, and is considered adequate at present. A preferable location would have been 200' west. The present landowner has been on this property about eight years, which might indicate how well management is able to adjust over time. Although this is a combination stockpass-drainage, the drainage does not severely hamper the use of the structure. This is considered an adequate structure.

REMARKS: The location of this stockpass, in a drain channel with potential runoff and sloped banks on either side, would seem to make this a stockpass of poor utility. The landowner's experience with this particular structure tells us different. The fact that it is only 60' in length and 9'6" in width probably has a great deal to do with the usability.

FI 117 (10)
BIG TIMBER WEST

9'6" span x 5'7" rise x 60' in length
Squash Corrugated Metal Pipe



NORTH ENTRANCE



SOUTH ENTRANCE



Looking north from NORTH ENTRANCE



Looking south from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1" = 1/2 mile

Principal Severance Situation

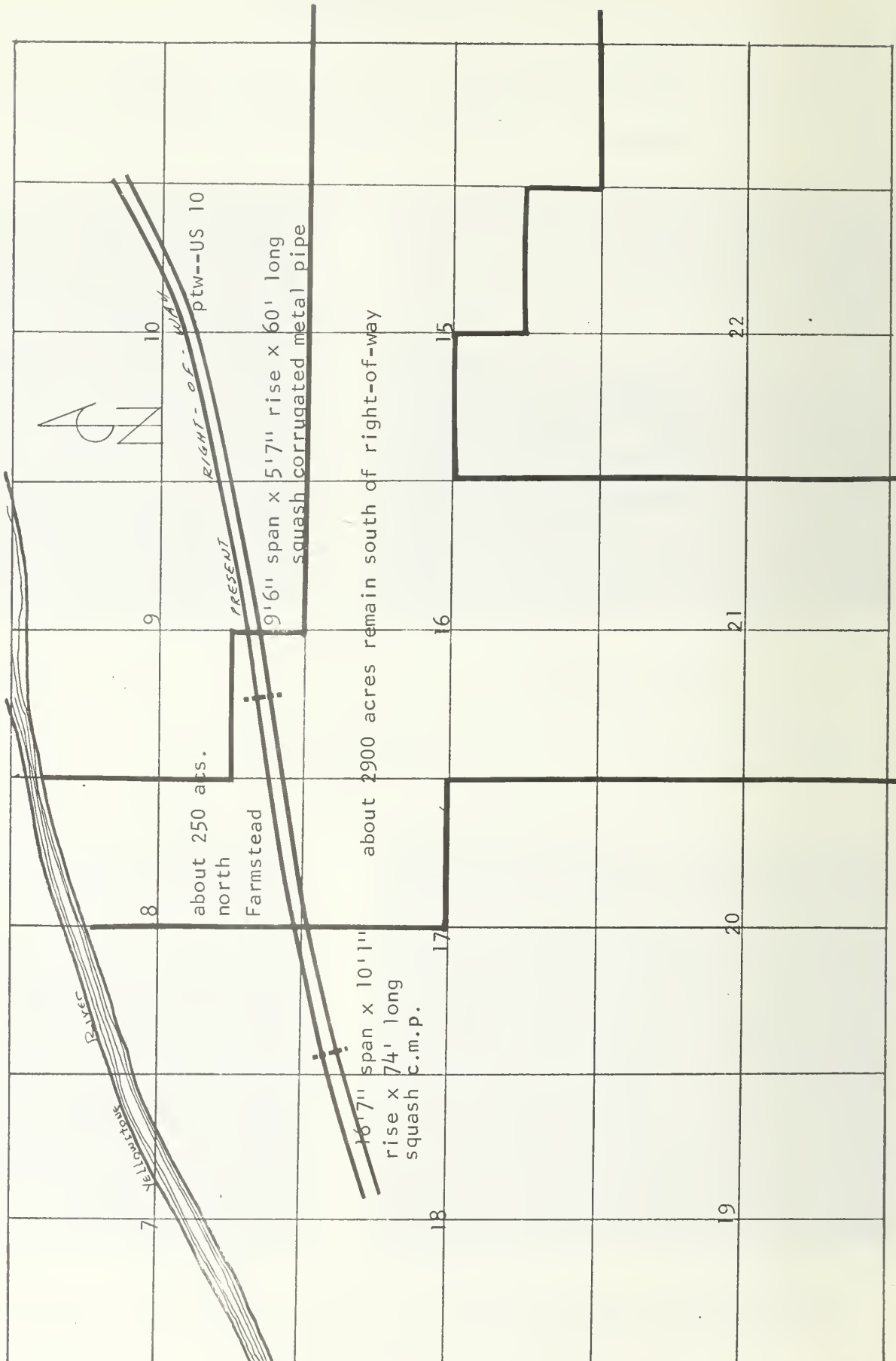
Winter feeding area separated from
Headquarters

DATE 8/70

CASE STUDY NO. 40

PARCEL NO. N.A.

PROJECT NO. FI-117(10)



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 41 Non-controlled access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters separated from winter feeding area. About 240 acres remain north, and about 2,000 remain south.

TYPE OF OPERATION: Cow-calf and feeder. Two landowners use this underpass. Rucker has about 30 animal units, and Jarrett 200 animal units; however, Rucker uses it primarily to get to his irrigation supply ditch. Jarrett uses the underpass to move cattle from headquarters to grazing, especially during winter feeding.

LOCATION: West of Big Timber, located in Section 17, Township 1 South, Range 13 East, M.P.M., Sweetgrass County, Station 1178+40 of F1 117 (10).

STRUCTURE TYPE: 16' 7" Span x 10' 1" Rise x 74' in length, squash corrugated metal pipe with about 6' of cover. Combination machinery-stockpass-drainage.

SPECIFIC PROBLEMS: This pipe is located in a creek bed with water present most of the time. There is very little snow problem to contend with. There apparently isn't any problem with the combination usage of livestock, vehicles, and drainage.

ADEQUACY: The landowners consider the structure adequate for their needs at present. It is considered in an ideal location. It has been in use about twenty years, and has heavy seasonal usage during winter feeding. Rucker used it to get to irrigation supply ditch, and Jarrett uses it to move cattle during winter feeding.

REMARKS: Periodic inspections of these combination structures might be advisable due to changes caused by erosion. Problems in future underpass locations might be avoided by this.

FI 117 (10)
BIG TIMBER WEST

16'7" span x 10'1" rise x 74' in length
Squash Corrugated Metal Pipe



NORTH ENTRANCE



SOUTH ENTRANCE



Looking north from NORTH ENTRANCE

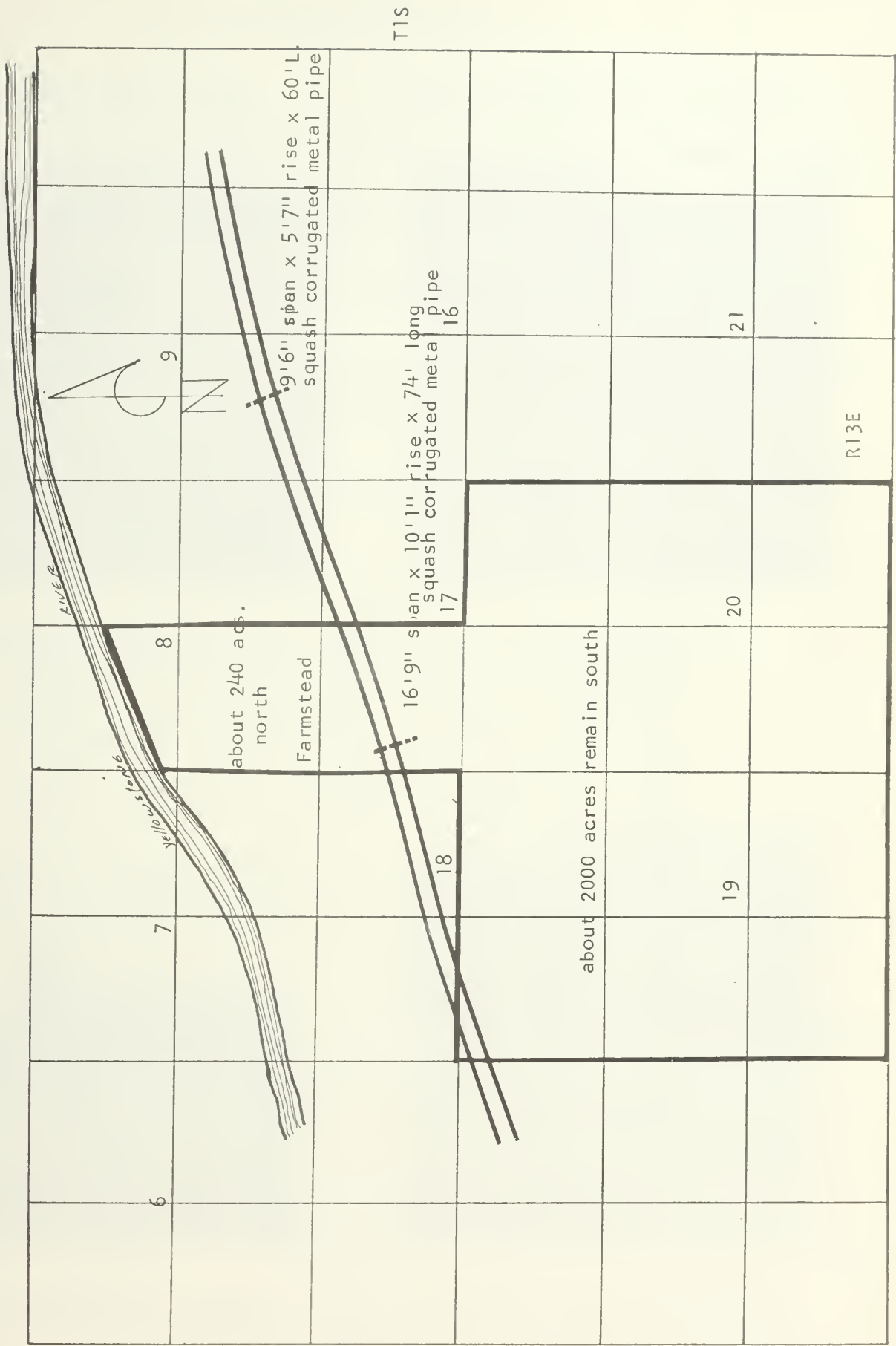


Looking south from SOUTH ENTRANCE

SCALE $1'' = \frac{1}{2}$ mile

Principal Severance Situation Headquarters separated from winter feeding area

DATE 7/70 CASE STUDY NO. 41 PARCEL NO. N.A. PROJECT NO. F1 - 117(10)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 25 - Non-Controlled Access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Separated winter meadowland pastures.

TYPE OF OPERATION: Cow-calf -- about 216 head; 140 acres remain left and 3,531 acres of deeded and 320 acres of leased land remain right.

LOCATION: Seven miles southeast of Belt, Montana, located in Section 25, Township 18 North, Range 6 East, M.P.M., Cascade County, Station 953+53 on Project F 73 (4).

STRUCTURE TYPE: 5'10" span x 7'7" rise x 96' in length (Type B), arch corrugated metal pipe. Actual measurement is 5'7" span x 8' rise with 8" of gravel leaving actual clearance of 7'4". Stockpass only.

SPECIFIC PROBLEMS: Replacement heifers were reluctant at first to go through the underpass. This amounts to about 15% of his herd, or 30 heifers. They soon became used to the structure and went through with the rest of the herd.

ADEQUACY: The investigator states the owner is completely sold on the adequacy of the structure. He said the installation had helped his overall operation because it eliminated the necessity of opening two gates, driving cattle back and forth across the highway, and gave him overall control of the herd that he did not have before. He pointed out he could keep the bulls separate from the rest of the herd by merely closing a gate at the stockpass entrance or, if he desired, could let the herd run together and cross as they wished. He did mention that if the stockpass had not been installed, his operating costs would have increased an immeasurable amount. The location is in the best of possible locations. There is a good chip gravel bedding in the pipe and at each end of the stockpass.

Each of the three owners on this project brought out the fact that the safety factor alone justified the cost of installing the stockpass. The investigator feels the structure more than offset a probable depreciation appraisal without a stockpass. In that it has been in use only one season, it may be too early to completely determine the adequacy.

REMARKS: It is interesting to note that the location of this stockpass helped to alleviate snow and winter conditions. They had no trouble with snow last season and it receives good protection from the predominantly southwest winds by a steep hillside which is located approximately 150' west of the entrance.

Although this has been in use only one season, the landowner said they had no trouble getting the cows or calves to go through the stockpass, with the exception of the replacement heifers.

F 73 (4)
Riceville-Armington



EAST ENTRANCE



WEST ENTRANCE



Looking East from EAST ENTRANCE

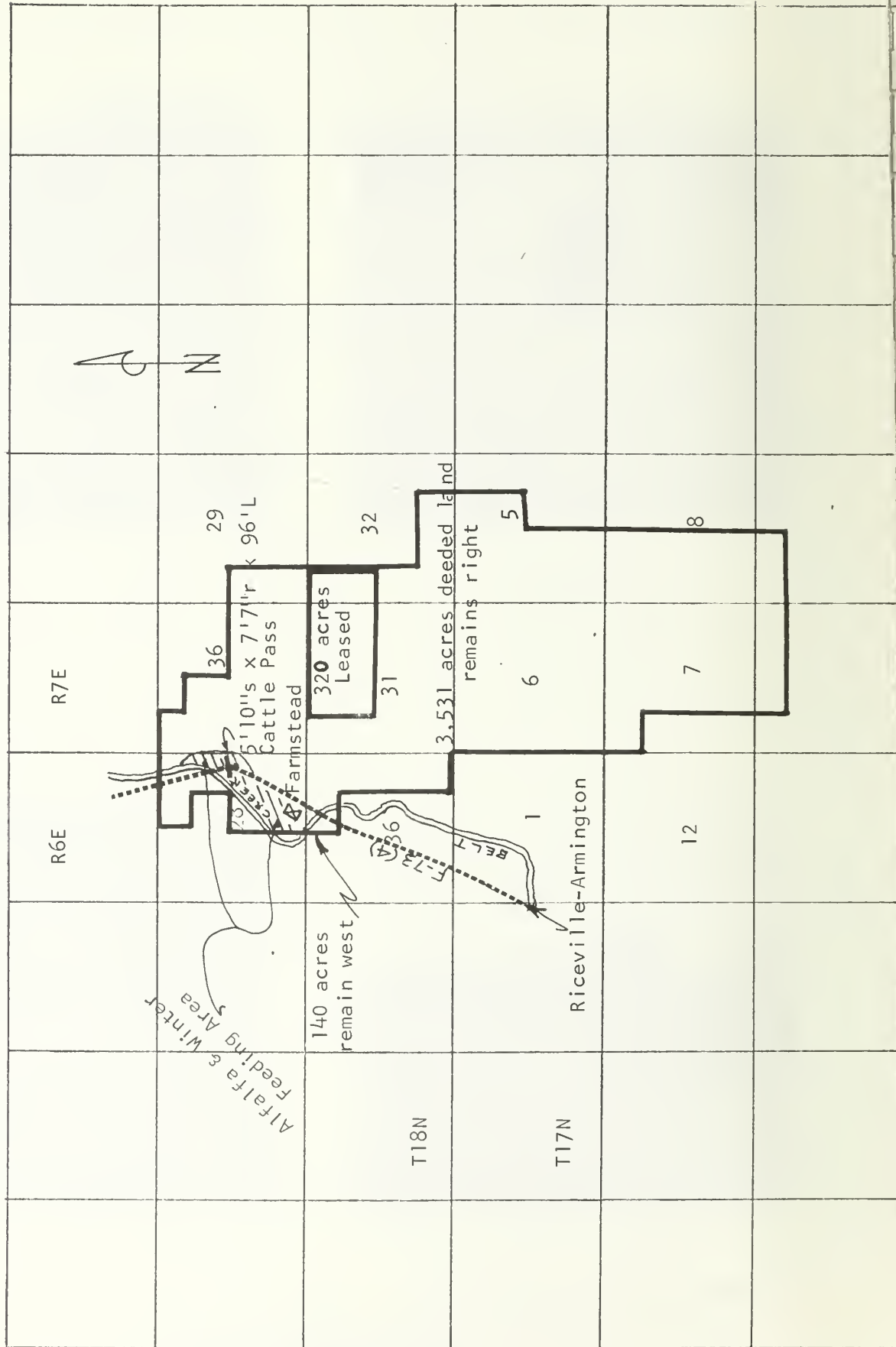


Looking West from WEST ENTRANCE

Type "B" Stockpass; 5'10" rise
x 7'7" span x 96' long

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Separated winter meadowland pastures
DATE 8/70 CASE STUDY NO. 25 STRUCTURE AGE 1 year PROJECT NO. F 73 (4)



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 26 Non-controlled access DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters separated from winter feeding area.

TYPE OF OPERATION: Cow-calf -- 75 head, keeps 20% replacement heifers. 585 acres remain left, and 951 acres remain right.

LOCATION: Seven miles southeast of Belt, Montana, located in Section 24, Township 18 North, Range 6 East, M.P.M., Cascade County, Station 990+00 on F 73 (4).

STRUCTURE TYPE: 5' 10" Span x 7' 7" Rise x 98' in length (Type B), with approximately 5' of fill over the pipe. Combination stockpass-drainage.

SPECIFIC PROBLEMS: Distances to fields are longer since the new construction. The owner states he had difficulty getting the cattle to use the stockpass. Other owners, however, said they have seen cattle use it frequently. The owner claims the stockpass was blocked with snow last winter, not only from snowfall, but from Highway Commission snowplows. This would happen most likely during a heavy snowfall.

ADEQUACY: The owner considers the stockpass less than adequate. The interior shows signs of heavy usage with numerous tracks and considerable manure inside the pipe. Although the owner does not think this is doing the job it was intended to do, other evidence shows cattle have been using the underpass without hesitation. It might be that cattle will use it, left to roam at will, but cannot be driven through it. The other two owners on the project have Type B stockpasses with the same approximate length, and indicate a satisfaction with them. Management problems are quite different in each ranch unit as pertains to highway severance; however, the safety factor would lend a great deal of justification to any use these structures have on this stretch of highway.

The landowner considers this inadequate, that the location should have been different, and does not feel very positive towards the utility of this structure. If the locational determination was drainage oriented, it would lend some credence to the locational criticism. This is a matter of opinion, although the investigator mentions the stockpass replaced a 36" drainage pipe originally planned, to provide for stock usage in addition.

REMARKS: Stockpass - ranch value ratio is 12 1/2%. An important factor to consider is the "double" barrier crossing on this ranch, Belt Creek, and the highway. These factors could influence the landowner against making optimum use of the land. It is not likely a larger structure would have alleviated the problem in this situation. A visit to this location on 1/21/71, after two blizzards of snow and wind, did not show snow problems. Cattle were pasturing on the uphill side of the roadway, and using the underpass.

F 73 (4)
Riceville-Armington

Type "B"; 5'10" x 7'7" x 98' long
Stockpass-Drainage



EAST ENTRANCE



WEST ENTRANCE
Bottom of Draw



LOOKING NORTHEAST
Showing Belt Creek; wing fence
to stockpass in foreground



LOOKING WEST
Notice drainage draw



EAST ENTRANCE
Notice drainage from upper draw

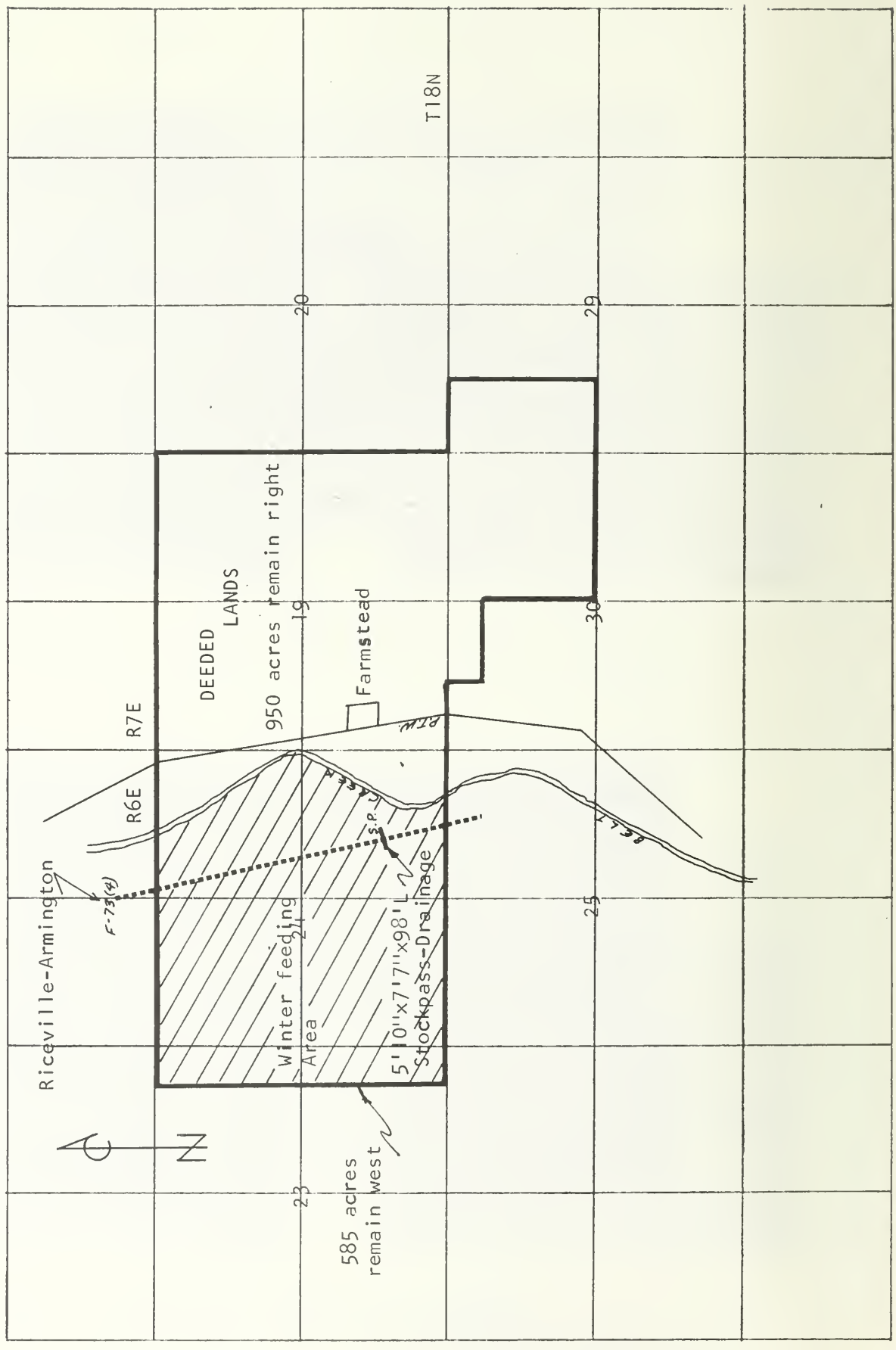


Looking EAST from EAST ENTRANCE
Compare to lower left photo on
previous page.

OWNERSHIP PLAT

SCALE 1" = 1/2 mile Principal Severance Situation Headquarters separated from winter feeding area

DATE 9-14-70 CASE STUDY NO. 26 STRUCTURE AGE 1 year PROJECT NO. F 73 (4)



LIVESTOCK & VEHICULAR UNDERPASSES

CASE STUDY NO. 27 - Non-Controlled Access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of winter feeding meadows. Water (Belt Creek) isolated on one side.

TYPE OF OPERATION: Cow-calf with about 115 head. 1,337 acres remain west and 134 acres remain east.

LOCATION: Three and one-half miles southeast of Belt in Section 12, Township 18 North, Range 6 East, M.P.M., Cascade County, Station 1124 of Project F 73 (4).

STRUCTURE TYPE: 5'10" span x 7'7" rise x 88' in length (Type B). There is about 1'4" of fill over the pipe. Combination drainage-stockpass. Actual measurement is 5'8" span x 8' rise.

SPECIFIC PROBLEMS: Poor drainage -- water tends to collect in structure, but this was anticipated before construction. No grade indicated on stockpass, which would tend to lessen structure's drainage possibilities.

ADEQUACY: The owner uses the stockpass from October to April and says that it is completely adequate for his need. He said he had no trouble getting any of the cattle to go through the pass. The stockpass fills with approximately three feet of water early in the spring and normally dries out by August 1st. Due to the high water table, this was expected. The owner still seemed very pleased to have this structure, not only because it decreases operating costs, but due to the safety factor.

REMARKS: This appears to be in the best possible location, even though there is a water problem. It was originally scheduled to be installed at Station 1125+00, but at the owner's request, was moved to 1124+00. The original location would have placed the exit too close to Belt Creek. The owner claims he would have no trouble getting cattle through the underpass if it became necessary to use it during wet periods.

Sufficient bedding material was placed in the pipe at the time of construction to make the walkway adequate.

F 73 (4)
Riceville - Armington

Type "B"; 5'10" span x 7'7" rise x 88'L.



EAST ENTRANCE; 6" of water



WEST ENTRANCE; 6" of water



LOOKING WEST



LOOKING EAST -- Belt Creek on left

Case Study No. 27

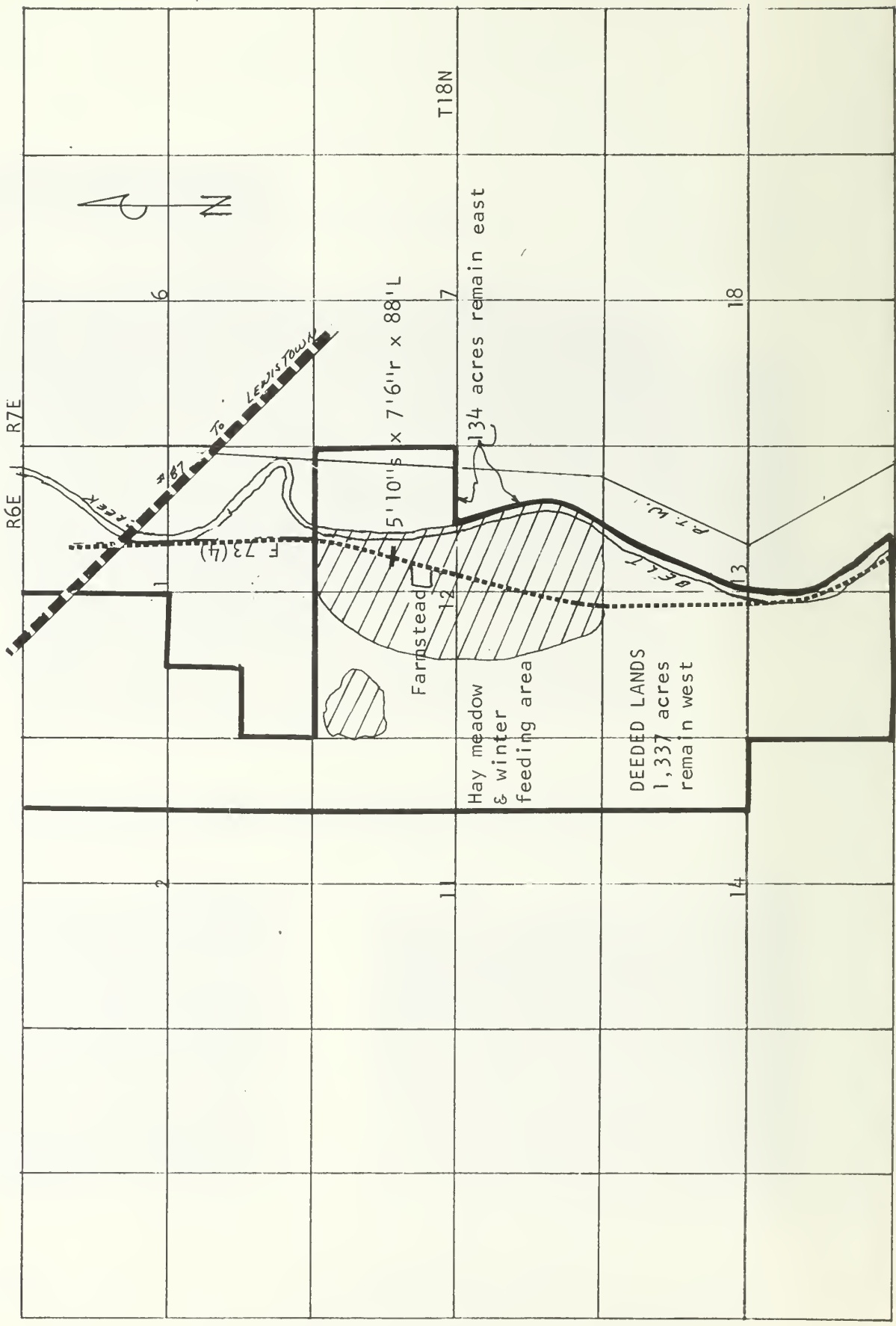


EAST ENTRANCE; photo taken 1/19/71 showing snow conditions, ice in pipe bottom.

OWNERSHIP PLAT

SCALE 1" = 1/2 mile Principal Severance Situation Winter pastures separated from Belt Creek; Headquarters

DATE 8/70 CASE STUDY NO. 27 STRUCTURE AGE 1 year PROJECT NO. F 73 (4)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 28 - Non-Controlled Access

DATE OF INSPECTION: August, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures.

TYPE OF OPERATION: Cow-calf, consisting of about 100 head of cows and 20% of calf crop is retained for replacement. About 570 acres remain east and 850 acres remain west of the right-of-way.

LOCATION: 2-3/4 miles northwest of Geraldine, Montana, located in Section 26, Township 22 North, Range 11 East, M.P.M., Chouteau County, Station 1283+52 of Project S 290 (15), more commonly referred to as "Highway 230".

STRUCTURE TYPE: 11'5" x 7'3" arch corrugated metal pipe, 82' in length with 3 to 4 feet of fill over pipe. Combination stockpass-drainage. Actual dimensions are the same.

SPECIFIC PROBLEMS: The stockpass is located in a coulee that carries year-round water from a spring and runoff from the land lying to the west. Two years ago, during the spring runoff, the pipe was not large enough to carry the flow and the highway had a foot or more of water running over it for one-half mile. There is a foot drop from right to left, which appears adequate for an 82' structure. All gravel stabilization at entrances have since been washed away. Access remains poor because of this.

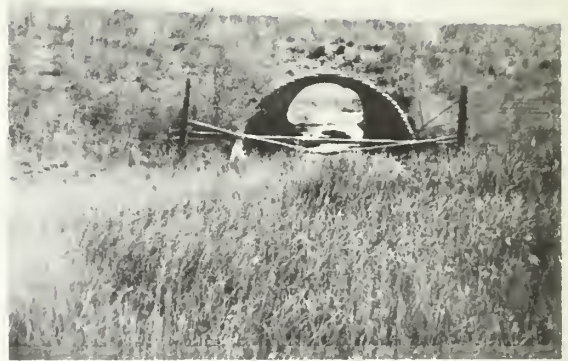
ADEQUACY: The landowner said that as a stockpass the structure was adequate for the job it was designed to do, but feels it should have been larger to handle drainage. The original plans called for two pipes, one 36" for drainage and a larger one to serve as a stockpass. However, during negotiations the owner insisted on one large structure and as a result, the present 11'5" x 7'3" pipe was installed. By using two pipes, the Design Section felt the smaller pipe would take care of normal drainage, leaving the larger one dry for use as a stockpass. The owner now feels he should have had separate structures. The owner prefers to use this only when traffic is heavy. He has a large enough family to provide manpower for cattle crossing once a year.

REMARKS: Access stabilization appears to be a problem for the combination drainage-stockpass structure. Possibly some combination of rock and asphaltic pavement is a necessary combination for these structures. The unusual runoff was not normal for the year, and the water ran over the highway, so the design was probably adequate to handle drainage for the normal years. This affects stock movement during the rainy months.

11'5" span x 7'3" rise x 82' L.
Squash corrugated metal pipe



EAST ENTRANCE (Fenced)



WEST ENTRANCE



LOOKING EAST; Notice fencing



LOOKING WEST; Notice drainage area

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 29 - Non-Controlled Access

DATE OF INSPECTION: August, 1970

PRINCIPAL SITUATION: Separated pastures (seasonal).

TYPE OF OPERATION: This is a typical cow-calf operation consisting of 200 head of cows. Severance acreage was not available.

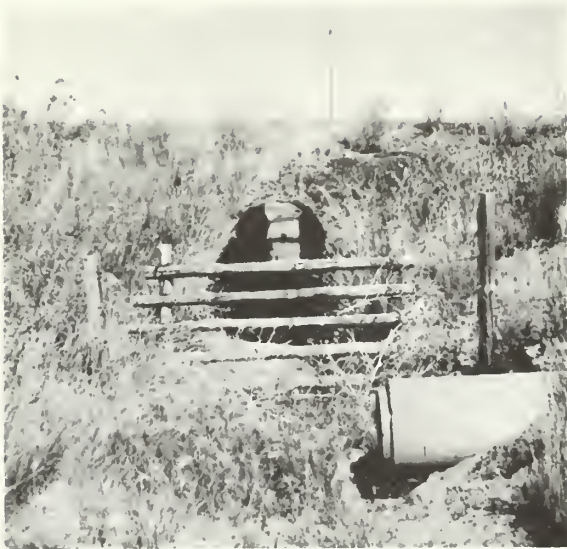
LOCATION: 4 3/4 miles east of Raynesford, Montana, located in Sections 1 and 2, Township 17 North, Range 8 East, MPM, Judith Basin Co., Station 759+60 of Project F 235 (15).

STRUCTURE TYPE: 5'10" span x 6'6" rise x 76' length with 3 feet of fill on pipe. (Type "A", Standard Drawing 59-02). Actual measurements are 5'7" span x 6' rise (from paved bottom). Combination stockpass-drainage.

SPECIFIC PROBLEMS: Pipe originally had loose gravel in the bottom, and rancher had to install pavement to stabilize it. Horses slipped on the original gravel placed in the pipe. Apparently it was loose chips and not enough fine dirt to compact it.

ADEQUACY: The owner says the stockpass is completely adequate for his needs since he placed the blacktop in the bottom to keep horses from slipping. Drainage is adequate because of proper installation and a 2' drop in the pipe, which amounts to about a 3% grade. The stockpass extends from deeded lands and state lands leased by the owner of the deeded lands. The stockpass replaced an existing stockpass and is as adequate as the original pass was, since the bottom was lined with blacktop. The separated pasture is also a convenient holding pasture for bulls.

REMARKS: This is a good example of what is needed in the bottom of a combination stockpass drainage. Without a good paved or compact bottom, the drainage will wash the corrugation clean. It would appear asphalt paving is necessary in any structure which is used as a combination drainage and stockpass. A drainage pipe empties into the north entrance and carries highway ditch drainage through the stockpass.



NORTH ENTRANCE



SOUTH ENTRANCE

TYPE "A": 5' 10" X 6' 6"
Corrugated Metal Pipe 76' in Length



Looking North from
NORTH ENTRANCE



Looking South from
SOUTH ENTRANCE

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 42 - Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separated hay meadows; about 44,698 acres remain northwest and 318 acres remain southeast.

TYPE OF OPERATION: This is a typical large cow-calf operation consisting of approximately 1600 cows. About 20% held over as replacement heifers.

LOCATION: Two miles north of Wolf Creek, Montana, which is in Section 30, Township 15 North, Range 3 West, M.P.M., Lewis & Clark County, Station 689+00 of Project I 15-4 (13).

STRUCTURE TYPE: 16'2" span x 14'10" rise x 158' long, corrugated metal pipe. Combination vehicular-stockpass and drainage usage. Actual measurement is span= 16' and rise = 14' to pipe roadway. There is about 4' of cover on the pipe.

SPECIFIC PROBLEMS: This structure is located in a recessed area and has a little mud in the bottom near the exit on the northwest side, but not enough to create a problem. There is a drain ditch running parallel to and on the north side of the access road leading into the exit north and west of the right-of-way, and this handles any large runoff. The stock presently go through the pipe with no hesitancy.

ADEQUACY: This structure is used mostly for farm machinery. There are two other livestock underpasses on the property, and cattle use this structure for grazing the aftermath east of the interstate. It is also used when the cattle are trailed to Wolf Creek for shipment to market. The person interviewed felt the pipe was adequate and in the best possible location for the owner's operation. There is a 6" drop in the length of the pipe, allowing some, but not a lot, of grade for drainage. The structure is considered adequate for the use for which it was intended.

REMARKS: The structure appears to be in the best possible location, even though there is some mud accumulating at the outlet. This is a good example for similar situations of a structure with a high degree of utility for stock and machinery.

I 15-4 (13)
WOLF CREEK NORTH

16'2" span x 14'10" rise x 158' long
Corrugated Metal Pipe



SOUTHEAST ENTRANCE



NORTHWEST ENTRANCE



Looking Southeast from SOUTHEAST ENT.



Looking Northwest from NORTHWEST ENT.

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 43 - Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Cropland separated from main unit. About 2,000 acres remain south, and 8,000 acres remain north.

TYPE OF OPERATION: Large farming operation.

LOCATION: About two and three miles west of Great Falls, Montana, located in the north half of Section 10, Township 21 North, Range 2 East, M.P.M., Cascade County, Stations 875+00 and 1145+00 of Project 1 15-5 (9).

STRUCTURE TYPES: Two structures: 16' span x 12' rise x 110' in length, bridge-type concrete box. Actual measurements are 12' span x 15'10" at 875+00 and 12' span x 13'7" rise at 1145+00. Vehicular underpasses.

SPECIFIC PROBLEMS: The landowner says the structure is not large enough to accommodate any of his equipment except trucks, and as a result, he has leased the acreage consisting of approximately 2,000 acres lying south and left of the interstate. His combines are 24' wide and duckfeet 84' wide. He has a loss in crop production from 1,000 of the 2,000 acres and does not feel it economically feasible to buy smaller equipment to farm the parcel.

ADEQUACY: These structures have utility for grain trucks. The owner has grain bins on the severed acreage that would require several miles of travel without these two structures. Otherwise, there would be little use because of his large machinery widths. The vehicular underpasses would have to be considered superadequate for this trucking purpose. No structure could accommodate his remaining equipment; therefore, this structure would appear inadequate for its intended usage. Conditionally adequate.

REMARKS: It would probably have cost the State less to relocate the grain bins on the north side of the right-of-way than to construct these two structures. Undoubtedly, the problem confronting the justification of the structure was that of cost to cure versus damage. Perhaps at the time of installation, had he invested in a smaller cutter head and tilling equipment, it might have proved economical to continue operating south of the right-of-way. As it is, these now appear superadequate for the present use.

I 15-5 (9)
GREAT FALLS WEST (2 mi.)

16' span x 12' rise x 110' in length
Bridge-type Concrete Box



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from top of NORTH ENTRANCE



Looking South from top of SOUTH ENTRANCE

I 15-5 (9)
GREAT FALLS WEST (3 Mi.)

16' span x 12' rise x 110' in length
Bridge-type Concrete Box



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from top of NORTH ENTRANCE



Looking South from top of SOUTH ENTRANCE

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 44 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures; 115 acres remain north and 379 acres remain south.

TYPE OF OPERATION: Cow-calf -- about 30 head of cows. Sells old cows and 80% of calves. Some farming involved.

LOCATION: One and one-half miles east of Pendroy, Montana, located in Sections 22 and 27 of Township 27 North, Range 5 West, M.P.M., Teton County, Station 239+50 of Project S 310 (7).

STRUCTURE TYPE: Corrugated metal pipe, 90" x 96' long, with about 6 feet of cover. There is a 27° skew, and the pipe grade is flat. Stockpass-drainage.

SPECIFIC PROBLEMS: The owner says he has had a drainage problem with silt, mud, and water build-up inside the pipe to a depth of 15 or 16 inches, and has had to clean it out several times before he could use it in the spring. This structure was originally designed for drainage only, however.

During construction, several holes were drilled west by southwest of the pipe, and as a result there has been a continual stream of water running down the borrow pit, creating a boggy condition at the south end of the pipe. The owner periodically constructs a ditch diverting its flow into the 36" drain located east of the stockpass, 130 feet.

The owner sold his cleated cat and bought a rubber-tired tractor because he didn't like the inconvenience of putting down old tires to walk his cat across the blacktop.

Snow blocks the stockpass from about December until April, preventing the full use of the grazing land south of the highway. An open winter would allow passage.

ADEQUACY: The owner states he has never had any trouble getting any of the cattle to go through the pipe once it was cleaned out. He also feels it is in the best possible location. Snow is a problem because it prevents year-around use. If rainfall is normal, his unit will remain balanced, but a dry year will cause stock-water management problems with the severed portion. The owner feels the structure to be adequate.

REMARKS: Whereas a 36" pipe was installed when the 7½' stockpass-drainage was lengthened five years ago, it did not seem to affect the runoff appreciably. There is still a silt collection and a boggy south entrance during wet periods. Only recommendation would be stabilization of the area near the pipe, and a better drainage pattern to utilize the 36" drain pipe, if at all possible.

S 310 (7)
PENDROY EAST

90" x 96' long Corrugated Metal Pipe
Stockpass-Drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 45 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separated grazing pastures in leased lands.

TYPE OF OPERATION: This is a combination farm and small-scale stock producing operation, with the owner running between 30 and 35 head of cows. About 20% are held for replacement.

LOCATION: One and one-half miles east of Pendroy, Montana, located in Section 21 and 28 of Township 27 North, Range 5 West, M.P.M., Teton County, Station 178+88 of Project S 310 (7).

STRUCTURE TYPE: Corrugated metal pipe, 90" x 134' long. Combination stockpass-drainage. Actual measurement varies as a result of the bulging.

SPECIFIC PROBLEMS: Normally, they have no trouble getting the livestock to use the pipe; however, sometimes in the early spring the bottom fills with ice and they have to cover it with straw to keep the stock from slipping. Due to lengthening the old 61' structure to 134', the top of the pipe is bulging and reducing the height within the pipe. This could be the result of additional fill used when the new road was built. At present, it has not affected the utility of the pipe, but if it worsens, it could create some major problems. There are no major snow problems.

The south end of the pipe (outlet) has eroded and is undercut, leaving the pipe about a foot above the ground. It didn't seem to bother the cattle using it. Keep in mind there is a small number of stock in this operation, and would therefore be more manageable than a larger stock unit. Keep in mind, however, this structure was originally designed for drainage only.

ADEQUACY: The owner said he felt the pipe was adequate for his operation, and is in the best possible location. The present extended structure has been in use for 5 years. Physical problems may be the largest deterrent to future adequacy i.e., the bending and settling in the center of the pipe.

REMARKS: Normally a structural plate pipe is installed all at one time, allowing for fill stress by squeezing the circular pipe in an oblong shape to settle into its proper designed dimensions. If one must be lengthened, proper design, construction, and inspection must take place to ensure the pipe maintains its designed dimensions.

90' x 134' Long, C.M.P.
Combination Stockpass-Drainage



NORTH ENTRANCE



SOUTH ENTRANCE

Undesirable access and footing



Looking North from top of blacktop over
North Entrance



Looking South from top of blacktop over
South Entrance

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 60 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Summer and fall pasture land separated from dairy buildings; about 107 acres remain north and about 117 acres remain south of the right-of-way.

TYPE OF OPERATION: This is a dairy farm consisting of 50 Holstein milk cows and 20 to 30 head of replacement cows and bulls.

LOCATION: About 2 miles west of Fort Shaw, Montana, located in Section 5, Township 20 North, Range 1 West, M.P.M., Cascade County. Station 468+50 of Project F 176 (5).

STRUCTURE TYPE: 5'10" span x 6'6" rise x 78' in length, Type "A" stockpass with about 4' of cover. Actual measurement is 5'8" span x 6'8" rise.

SPECIFIC PROBLEMS: Originally, there were no provisions to install a stockpass on this ownership, but one was installed for safety purposes at the insistence of the landowner. He claimed he had to move his dairy herd across twice a day for $2\frac{1}{2}$ to 3 months each year; however, he never did use the pipe. A recent purchaser of the property has plans for using it from summer through fall of 1971. The new owner says there is from 12 to 18 inches of water in the pipe during the irrigation season, as a result of seepage and waste water. There did not seem to be any grade on the pipe. There is some buildup of mud and gravel in the north end of the pipe. Apparently this end also fills with snow each winter; however, this shouldn't affect the buyer's intended method of operating because he only planned to use it during late summer and fall.

ADEQUACY: His neighbor feels he will have no trouble getting the cattle to go through the pipe. The herd consists entirely of Holsteins, and are supposedly quite easy to train to use the structure. He plans to construct wing fences at each end of the pipe and start using it as soon as he harvests his hay and other crops.

The owner has never used the stockpass, so he doesn't know yet whether it will be adequate for his needs or not. There is a good chance it will be quite satisfactory for his present operation. Because of topography and the railroad right-of-way, this pipe could not have been installed in any other location. It has never been used since it was installed seven years ago, but physical features and length of pipe are conducive to stock utility.

REMARKS: Although the underpass may have been an obsolete structure for seven years because of non-usage, it now will probably serve the safety purpose it originally was intended to do and hence, not turn out to be a bad investment.

F 176 (5)
FORT SHAW - WEST

5'10" span x 6'6" rise x 78' Long, C.M.P.
Stockpass



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE
Notice Borrow Area



Looking South from SOUTH ENTRANCE
Notice right of way fence, railroad

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 61 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters separated from ranching unit; about 23 acres remain north, and about 279 acres remain south.

TYPE OF OPERATION: Cow-calf -- typical ranch unit consisting of 100 head of cows with about 20% holdover for replacement heifers.

LOCATION: About $2\frac{1}{2}$ miles northwest of Fort Shaw, located in Section 4, Township 20 North, Range 1 West, M.P.M., Cascade County. Station 481+30 of Project F 176 (5).

STRUCTURE TYPE: 5'10" span x 6'6" rise x 72' long, C.M.P., Type "A" stockpass-drainage with about 2' of cover. Actual measurements are 5'8" span x 6'8" rise.

SPECIFIC PROBLEMS: Although a 48" drainage pipe carries most of the runoff water, the stockpass does not appear to have enough drop from south to north to carry any overflow. This is a minor problem, and does not affect the adequacy of the structure. Severance of land lying northwesterly by creek does not pose problems which were not already in existence.

ADEQUACY: The owner states the existing stockpass and drain are much better than the bridge they replaced. He said that the majority of the creek water runs through the drain, leaving the stockpass dry most of the time. He also said he could control his livestock better with a gate at the end of the pipe. He previously had trouble keeping a gate across the end of the old bridge because high water from the creek kept washing it out. This pipe is also protected from blowing snow because of its location in the coulee. The owner mentioned he never had any trouble getting the cattle to use the stockpass. The pipe is considered to be in the ideal location by the landowner and has been in use seven years. This is considered an adequate stockpass.

REMARKS: This stockpass is surprisingly free of typical problems encountered in others of the same size and use. Manure buildup, erosion, bog areas, locational deficiencies, are not a problem at this stockpass. The Type "A" and Type "B" definitely are a reasonable structure for free stock movement, provided they are not too long. This will be discussed in the body of the report.

F 176 (5)
FORT SHAW-SUN RIVER

5'10" span x 6'6" rise x 72' Long, C.M.P.
Type "A", Stockpass-Drainage



NORTHWEST ENTRANCE



SOUTHEAST ENTRANCE



Looking North from NORTHWEST ENTRANCE,
showing coulee, creek and cattle trail



Looking southeasterly from SOUTHEAST
ENTRANCE, showing trail under rail-
road bridge

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 62 - Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of summer pastures from headquarters; about 259 acres remain north of right-of-way and 298 acres remain south of right-of-way.

TYPE OF OPERATION: This is a typical small cow-calf unit consisting of 85 cows. The owner sells old cows and calves annually.

LOCATION: About four miles east of Wolf Creek, Montana, located in Section 20, Township 15 North, Range 3 West, M.P.M., Lewis and Clark County, Station 749+77 of Project 1 15-4 (23).

STRUCTURE TYPE: Double 132" diameter x 439' long, C.M.P., stockpass-drainage with about 23' of cover. One pipe measures 11'5" span x 10'3" rise and the second pipe measures 11' span x 10'6" rise.

SPECIFIC PROBLEMS: Neither pipe is being utilized at present and the structure has been there five years. The owner hopes that eventually he can get all of his livestock to use at least one as a stockpass. To date, only a few head have used either pipe. The main trouble appears to be footing, and there is almost no bedding in either pipe and the livestock slip or stumble on the corrugated metal. The approach to the pipe openings on the north is poor, because large "I" beams were installed about fifty feet in front of the pipes to prevent debris from washing into the pipes, and the livestock must come off a steep bank through large boulders to reach the entrance. The approach on the south is fair. Rock Creek runs through one of the pipes, and as a result, water collects at the end of the pipe on the south entrance. At access points, the water is not deep, the creek bottom is gravel, and the cattle should enter the pipe with no hesitancy; therefore, access to the pipes on both ends is suitable for livestock. A small dam was constructed to keep water out of one pipe, to keep it dry. It is no barrier for actual stock use. One access barrier is the steep rock bank pictured on the top right of the photo page. This was originally intended for drainage only.

Since construction of 1 15, the owner has had to truck about 16 miles to reach his summer ranges. Fencing has become a problem because the only way the owner can get material to the left side of the highway is to carry it by hand or horseback or to go by way of the Highway 287 interchange about 1 and 3/4 miles west. Also, the winter feeding area was reduced in size because of right-of-way purchase.

The pipes are well protected and snow has not caused any problems.

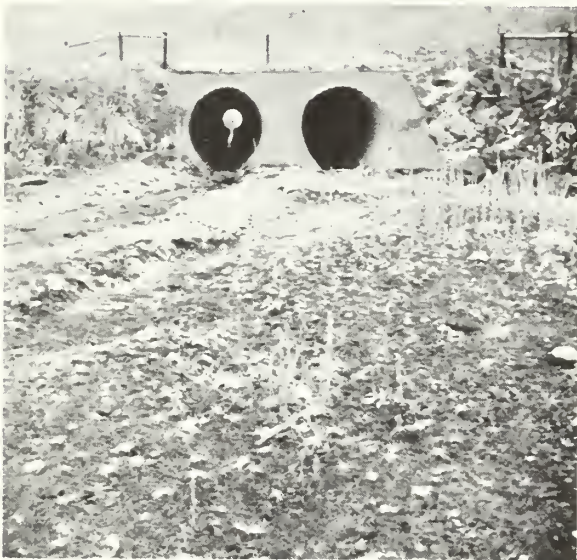
ADEQUACY: These pipes are definitely not adequate. Putting pavement in them would be too expensive. These pipes were intended for drain usage, and the pipes are located in the best possible place. The investigator feels one of these can be made usable by putting material in the bottom of one of the pipes (as long as it is kept dry). This could be a problem during periods of large runoffs.

REMARKS: It does not appear gravel and dirt stabilization would hold permanently for footing; therefore, pavement or possibly a manure-dirt combination would be the only material that would adhere to the corrugations. Hot mix with a blown asphalt cover of about 2 inches would work quite well.

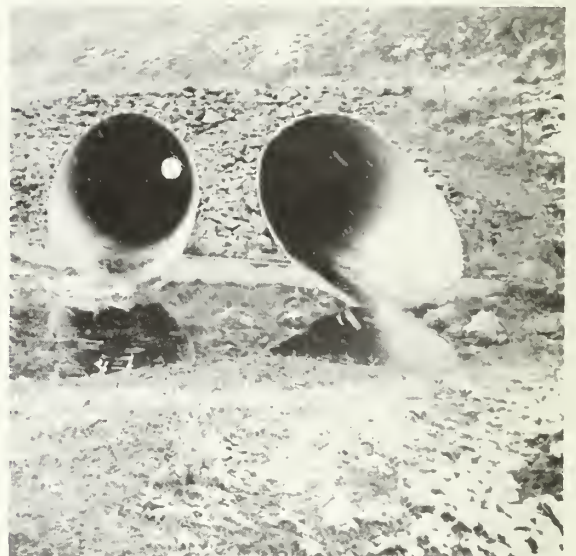
I 15-4 (23)
WOLF CREEK - NORTH

Double 132" diameter x 439" long, C.M.P.
Stockpass-Drainage

Showing cattle trail up the bank from
pipe access area



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE
Notice "I" beams for high water debris

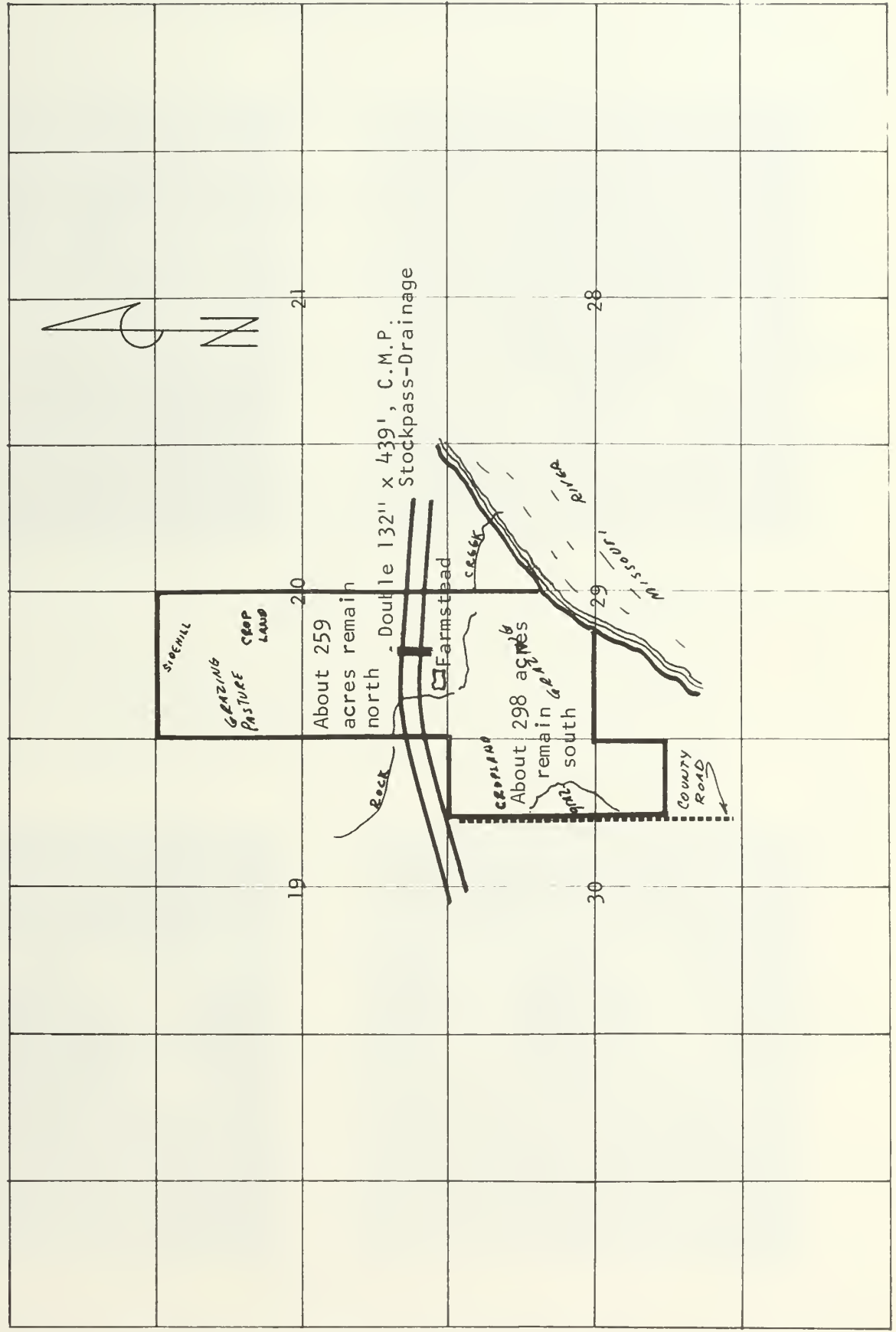


Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1/2 mile Principal Severance Situation Separation of summer pastures from headquarters

DATE 9/70 CASE STUDY NO. 62 STRUCTURE AGE 5 years PROJECT NO. 1 15-4 (23)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 63 - Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of cropland and grazing lease from headquarters.

TYPE OF OPERATION: The owner has about 100 head of dairy cows; milks about 70 head, and the other 30 are dry for replacement stock. He also has one bull.

LOCATION: About seven miles northeast of Wolf Creek, located in Section 10, Township 15 North, Range 3 West, M.P.M., Lewis and Clark County. Station 918+50 of Project 15-4 (23).

STRUCTURE TYPE: Double 108" diameter (9') x 276' long, C.M.P., drainage with about 18' of cover. Actual measurements are 8'6" span x 9'7" rise and 8'8" span x 9'4" rise.

SPECIFIC PROBLEMS: These two pipes were originally installed to serve as drain pipes. The dairy cattle do use them, however. He runs the bull, dry cows, and replacement stock on the acreage west of the right-of-way. He said he had trouble getting some of the cows to go through the pipes. There were two conditions under which cattle would refuse to travel through the pipes. (1) If there was ice in the pipe; (2) If the sunlight shone down through the median drain.

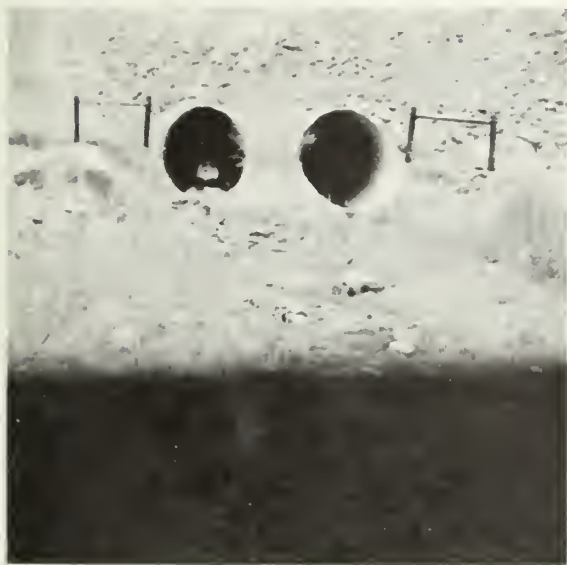
The owner must carry fencing material by hand or horseback to the severed acreage left, or west, of the right-of-way and can only use the pasture for his bull, replacement stock, and dry cows, where before he grazed the entire herd there. Although snow has never been a problem, there are times when the cattle refuse to go through the pipe because of ice on the bottom.

ADEQUACY: The owner said he didn't expect any of the cattle to use the pipes to begin with, and he is thankful they have. He points out they were installed as drains and not stockpasses, but says they are adequate for his revamped operation. He has had good luck using 4-H heifers to lead stubborn cows through. The pipes are located in the best possible location and have been there five years. They are considered adequate for his present use, even though not intended for stock.

REMARKS: This is a good example of a rancher who made use of a very functional drainage pipe, but normally very unfunctional as a stockpass. Length, location, access, lack of bedding material, and drainage would appear to be negative factors affecting potential stock usage. He does, however, find this functional for his dairy herd. Hereford cattle would be much more difficult to manage through this stockpass. There appear to be some encouraging results from some of the severed agricultural units, i.e. those who normally didn't expect utility of a structure were able to make some use of them.

I 15-4 (23)
WOLF CREEK - NORTH

Double 108" x 276' L, C.M.P., Drainage



EAST ENTRANCE



EAST ENTRANCE, North Pipe



WEST ENTRANCE, North Pipe



WEST ENTRANCE, South Pipe



Looking East from EAST ENTRANCE

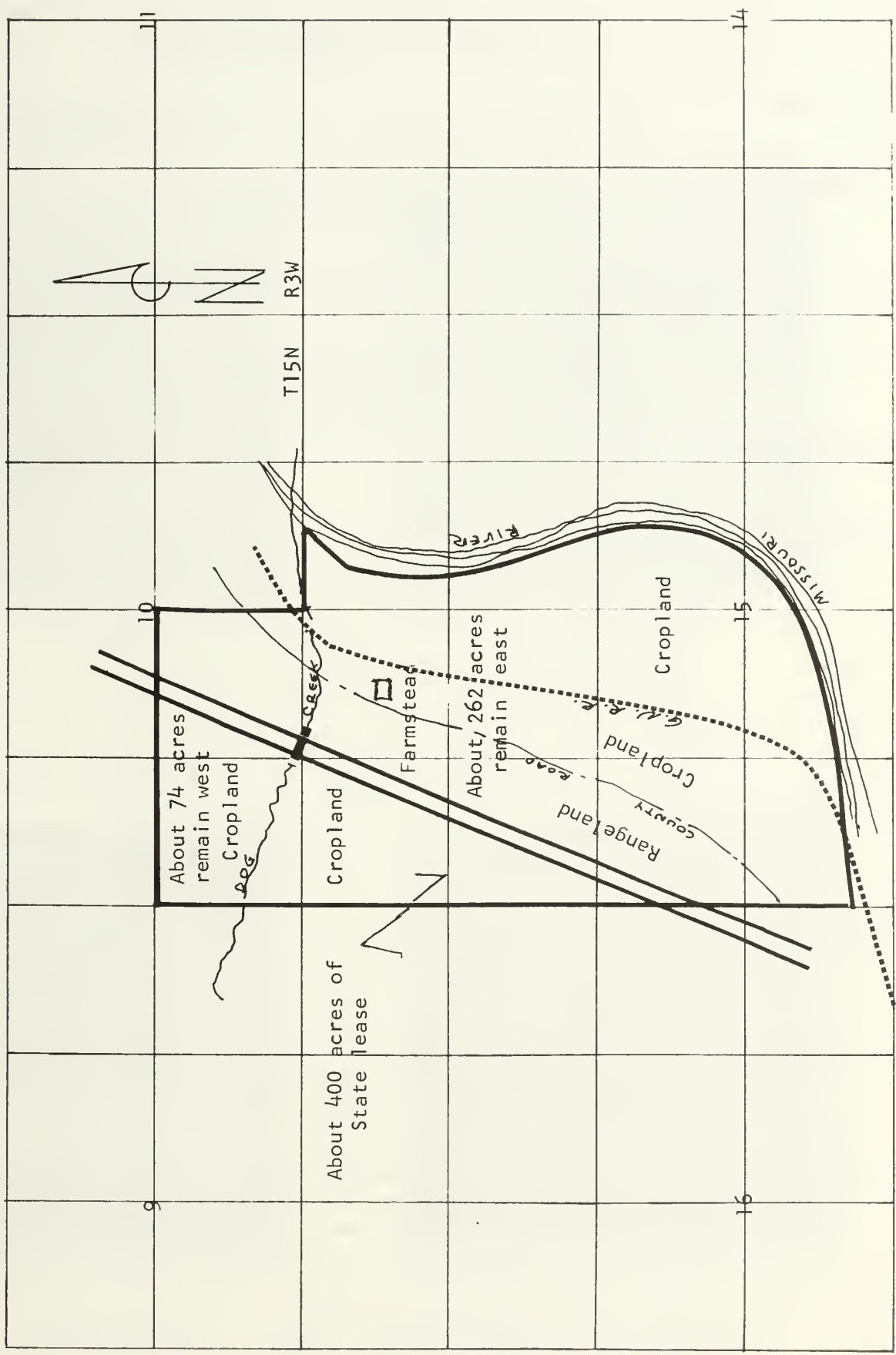


Looking West from WEST ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1/4 mile Principal Severance Situation Separation of cropland & grazing lease from headquarters

DATE 9/70 CASE STUDY NO. 63 STRUCTURE AGE 5 yrs. PROJECT NO. 1 15-4 (23)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 76 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of winter range from stock water. About 8,000 acres remain west and about 1,680 remain east, plus Forest Service grazing permit.

TYPE OF OPERATION: Typical cow-calf operation consisting of 300 head of Hereford cows. Keeps replacement stock to keep herd about same size.

LOCATION: The three pipes are about four to six miles south of Raynesford, located in Sections 20, 29, 32, Township 17 North, Range 8 East, M.P.M., Judith Basin County, Stations 319+75 and 426+78 and 376+00 on Project S 183 (1).

STRUCTURE TYPE: Three corrugated metal pipes, 5'10" span x 6'6" rise x 60' long. Type "A" stockpass-drainage.

SPECIFIC PROBLEMS: The major problem is snow and ice. This problem is a result of location and more than normal snowfall in this area. The owner mentioned all of his cattle went through the pipes when they were dry, but he always had trouble if there was ice on the bottom. The ice forms, primarily, from melting snow and spring runoff which then freezes. This is common to all three pipes. The rancher lost two head that had fallen on ice in the pipe bottoms, and the carcass of one still remains. He also had forty head trapped inside one pipe during a heavy snowstorm. He said it was only luck that he discovered them in time to get them out, and even then some developed pneumonia from getting too warm inside the steam-filled pipe and coming out in sub-zero temperatures.

The snow problems are a result of both storms and snow plowed over the roadside by State equipment. The owner said he had no alternative but to keep digging them out.

ADEQUACY: These structures would be considered "seasonally adequate" for summertime usage, but not adequate for wintertime usage. The owner thinks it would be best if there were some drop in each pipe and that the bottoms be lined with concrete. He thought this might help to eliminate buildup and make it easier to keep the pipes clean, as well as provide better footing for the livestock. These structures are located in the only possible place to serve as stockpasses. One was located on a second ownership with rights of usage because the topography of the owner's land prevented locating it there.

REMARKS: These structures are normally adequate for free stock movement. One large structure may have been the answer for driving stock and eliminating one or two of the others. However, in that this was a stock-to-water situation on winter range, one small pipe and one large pipe may have worked out much better. A larger arch pipe could be used for wintertime, closing the smaller pipe off. This would prevent overheating of cattle in the pipe moving through it in large numbers. The surface would be wide enough to allow more than one path also.

S 183 (1)
RAYNESFORD-SOUTH

5'10" span x 6'6" rise x 60' L., C.M.P.
Type "A" Stockpass-Drainage
Station 426 + 78



EAST ENTRANCE



WEST ENTRANCE



Looking East from EAST ENTRANCE



Looking West from WEST ENTRANCE

S 183 (1)
Station 426+78
Raynesford South



Cow is supposed to have died in this stockpass,
according to landowner. (slipped on the ice)
Confirmed existence of carcass in stockpass.

WEST ENTRANCE



Looking EAST from EAST ENTRANCE
Two Bulls on sidehill, opposite
side of road from headquarters.



EAST ENTRANCE

S 183 (1)
RAYNESFORD-SOUTH

5'10" span x 6'6" rise x 60' L., C.M.P.
Type "A" Stockpass-Drainage
Station 376 + 00



EAST ENTRANCE



WEST ENTRANCE



Looking East from EAST ENTRANCE



Looking West from WEST ENTRANCE

S 183 (1)
RAYNESFORD-SOUTH

5'10" span x 6'6" rise x 60' L., C.M.P.
Type "A" Stockpass-Drainage
Station 319 + 75



EAST ENTRANCE



WEST ENTRANCE



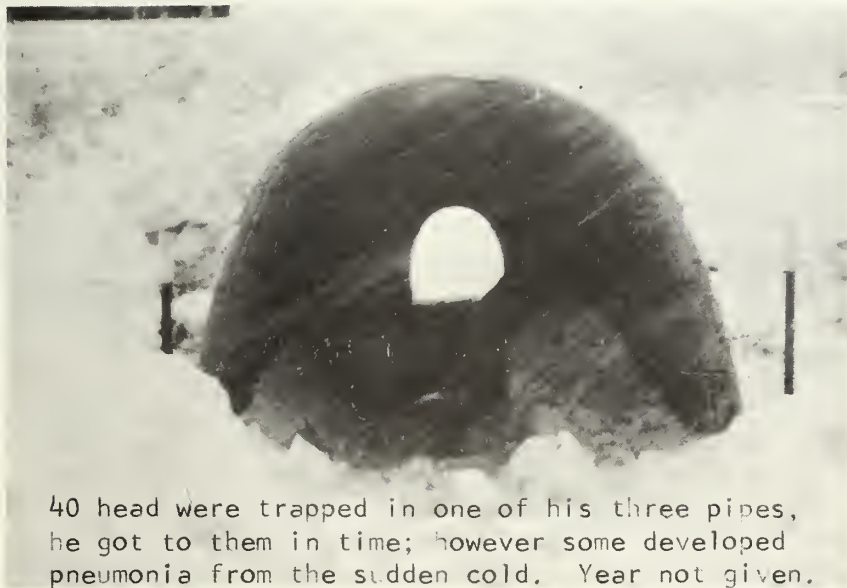
Looking East from EAST ENTRANCE



Looking West from WEST ENTRANCE

S 183 (1)
Station 319 + 75

Type "A", 60' long



EAST ENTRANCE
Pipe was in use Jan. 1971

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 77 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Winter feeding area separated from stock water. 150 acres of deeded land remain north, and 800 acres of leased and deeded land remain south.

TYPE OF OPERATION: Typical cow-calf operation consisting of 200 head of Black Angus cows. There is about 20% holdover for replacement heifers.

LOCATION: About three miles west of Raynesford, located in Section 35, Township 18 North, Range 7 East, M.P.M., Cascade County, Station 342+50 of Project F 235 (18).

STRUCTURE TYPE: 5'10" span x 6'6" rise x 76' long, C.M.P., Type "A" stockpass-drainage with about 2'4" of cover. Actual measurement 5'6" span x 6'6" rise.

SPECIFIC PROBLEMS: This is located in a recessed area and snow and water create problems. It fills with water in the spring from Otter Creek, which is located just north of the north entrance. Water remains in the pipe until late July or early August. The owner said that both ends fill with snow from storms and from snow plowed by State-owned equipment. He has no alternative but to keep digging it out. He feels the State should extend the pipe at least 6 feet on each end and allow him to construct snow fences on the right-of-way to protect the pipe openings. This was installed to replace a concrete 6' x 6' bridge that served as a stockpass under the original highway. A change of alignment made it necessary to install the new stockpass approximately 300 yards west of the old structure. At that time, he indicated to the Project Engineer that the new location was a poor one because of drifting snow and water. This winter he is going to request that the State extend the pipe on each end and permit him to attach some type of hinged doors in an effort to keep the openings free of snow.

ADEQUACY: The owner said if the pipe could be kept open in the winter, it would be adequate. However, he points out that this hasn't been the case so he feels it must be classed as inadequate. He also said that personnel from the Highway Commission had assured him the pipe would be as good as his old stockpass, and inasmuch as it wasn't, he felt the State was obligated to correct the problem. He mentioned he had filed several complaints, but so far nothing had come of them. He feels the pipe should have been located farther east where it would have had more protection from the predominately southwesterly winds. The approaches are stabilized with gravel and are in good condition.

REMARKS: Hinged doors are not the answer in this type of situation, because it has been tried. Larger equipment is then needed to plow the snow from in front of the stockpass entrance doors. Oftentimes, locational factors are insurmountable. As to the landowner's complaints of snow, communication during the preconstruction stage should be such that the landowner and Highway Commission agree on the structure's limitations. This is a critical stock-to-water situation. This has been in use since 1961 and the value ratio of underpass to ranch is about 17%.

F 235 (18)
ARMINGTON-RAYNESFORD

5'10" span x 6'6" rise x 76' L., C.M.P.
Type "A" Stockpass-Drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 78 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Grazing land (east) separated from stock water (west); about 200 acres remain west and 280 acres remain east.

TYPE OF OPERATION: Typical cow-calf, consisting of 100 cows. Sells old cows and calves annually, and holds back 20% of the heifers for replacement.

LOCATION: About six miles south of Raynesford, located in Section 5, Township 17 North, Range 8 East, M.P.M., Cascade County. Station 291+75 of Project S 183 (1).

STRUCTURE TYPE: 5'10" span x 6'6" rise x 60' long, C.M.P., Type "A" stockpass-drainage. Actual measurements are 6' span x 6'4" rise with about 2'4" of cover.

SPECIFIC PROBLEMS: None evident or stated by landowner, including snow.

ADEQUACY: The owner said that the pipe was completely adequate for his operation and located in the best possible place to provide access to the stock water. It has been in use 13 years and the owner also feels the most important feature is the safety factor.

REMARKS: Once need is established for a land use structure, safety features are very persuasive for installation justification, if there is insufficient economic justification on these non-controlled access highways.

S 183 (1)
RAYNESFORD-SOUTH

5'10" span x 6'6" rise x 60' L., C.M.P.
Type "A" Stockpass-Drainage



EAST ENTRANCE
3'x6" boards nailed in, during shipping



WEST ENTRANCE



Looking East from EAST ENTRANCE
Notice trail up embankment



Looking West from WEST ENTRANCE
Notice trails to creek

§ 183 (1)
Raynesford South
Winter Photos of a Seasonally
Used Stockpass



Looking EAST from EAST ENTRANCE
Notice drifting pattern, refer
to photo in same location on
previous page.



Looking down into WEST ENTRANCE
Drifted in and unusable

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 79 - Non-Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Winter feeding area (south) separated from stock water north of the highway. About 150 acres of deeded land remains north and 6,850 acres deeded and leased land remains south.

TYPE OF OPERATION: This is a mixed herd consisting of 1,000 head of bulls, cows, yearlings, and calves.

LOCATION: About $9\frac{1}{2}$ miles south of Raynesford in Section 18, Township 16 North, Range 8 East, M.P.M., Judith Basin County, Station 147+34 on Project S 183 (2).

STRUCTURE TYPE: 5'10" span x 6'6" rise and 60' long, C.M.P., Type 'A' stockpass, also used for drainage. Actual measurements are 5'6" span and 6'10" rise with about 3'8" of cover on the pipe.

SPECIFIC PROBLEMS: Although the pipe was installed to serve as a stockpass, it also carries runoff from the north side (notice meadowland in photo) of the highway. There is a little buildup of silt and dirt in the bottom of the pipe, but this is good in this case because it provides better footing for livestock. The north end builds up with snow during a heavy snowfall. He also said the snow plowed off the highway had closed the north opening several times in 1969.

ADEQUACY: The new owner said the pipe was completely adequate for his operation and located in the only possible place for use as a stockpass. Since purchasing the property, the new owner has extended a line beneath the highway and now has stock water available on both sides of the road. This is apparently through one of the drainage pipes.

REMARKS: This is a good example of high utility usage of a Type 'A' stockpass. The structure has been here 13 years and used by the present owner for 2 years. It is basically a stock-to-water severance situation; however, by installation of a water pipe, he now has water on both sides. Snow closure of the stockpass should not affect this aspect of his ranching unit as it probably did before installing water to the south of the right-of-way. Otherwise, his basic ranching methods of operation have not changed.

S 183 (2)
RAYNESFORD-SOUTH

5'10" span x 6'6" rise x 60' L., C.M.P.
Type "A" Stockpass-Drainage



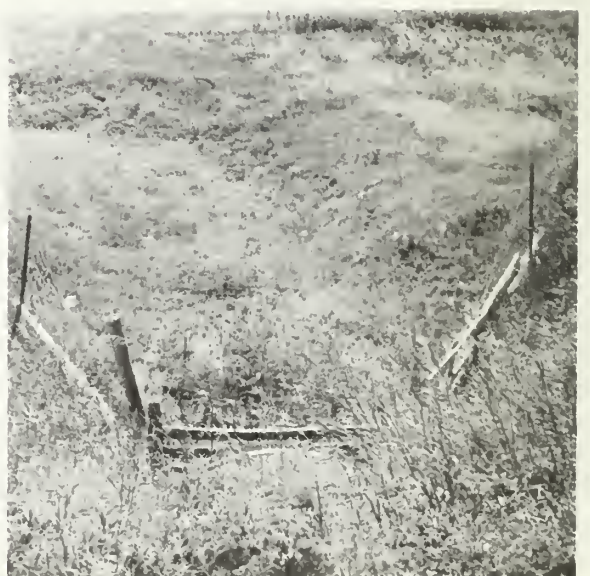
NORTH ENTRANCE



SOUTH ENTRANCE
Gate is in good repair



Looking North from NORTH ENTRANCE
Notice Farmstead



Looking South from SOUTH ENTRANCE

S 183 (2)
Raynesford South
Winter Photos



Gate Posts of the
Wing Fence

NORTH ENTRANCE
Notice Drifting Pattern of Snow



SOUTH ENTRANCE
Snow is crusted from warm temperature
and cold winds.

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 80 - Non-Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Winter feeding area south of right-of-way separated from stock water north. About 520 acres of fee land and 120 acres of leased land remain north and 320 acres of leased land remain to the south.

TYPE OF OPERATION: Registered Hereford ranch consisting of 150 cows and 35 bulls. The owner specializes in raising and selling bulls. He then holds back enough bull and heifer calves to replace the ones sold.

LOCATION: About 11½ miles southwest of Raynesford, located in Sections 14 and 23, Township 16 North, Range 7 East, M.P.M., Cascade County, Station 51+60 on Project S 183 (2).

STRUCTURE TYPE: 5'10" span x 6'6" rise x 60' long, C.M.P., Type "A" stockpass-drainage with about 2'4" of cover. Actual measurements are 6' span x 6'4" rise.

SPECIFIC PROBLEMS: There was no mention of the lease arrangement being a specific problem, but this stockpass is on land leased by them but not owned. Snow has been the most insurmountable problem. The owner said the snowdrifts get so deep, the pipe and even the right-of-way fences are completely covered, thus rendering the pipe useless. The winter-time usage of all pastures was impossible until they extended a water-line beneath the highway from the well on the north to an electrically heated stock water tank located south of the highway. This was in 1961 and before then they had to leave the cattle north of the highway where the water was, or truck stock water to the other side.

ADEQUACY: The owner said that when the stockpass is not blocked with snow, it is adequate. It is located in the only possible place according to topography (physical determination) of the area. He said the cattle had always gone through the pipe without hesitancy when it was not blocked with snow. He also feels snow would not block the underpass so badly if he were permitted to construct a snow fence within the right-of-way on each side of the pipe openings. This pipe would have to be considered "seasonally" adequate.

REMARKS: It is not likely that a change of location would alleviate the snow problems in the area because the blizzard conditions would, most generally, be more widespread, and therefore create similar problems up and down this road. A slight change in the topography oftentimes can make a difference as to the relationship of the stockpass and drifting snow; however, this is not very easy to determine without extensive knowledge of the area -- prevailing winds and average snowfall.

S 183 (2)
RAYNESFORD-SOUTH

5'10" span x 6'6" rise x 60' L., C.M.P.
Type "A" Stockpass-Drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

S 183 (2)
Raynesford South
Winter Photos



See previous page for spot
identification.

NORTH ENTRANCE
Notice drifting pattern, completely
covering the stockpass.



Looking NORTH from SOUTH ENTRANCE
Snow is crusted from warm temp-
eratures and cold winds.

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 7 - Controlled Access
With A Permissive Right

DATE OF INSPECTION: May, 1970

PRINCIPAL SEVERANCE SITUATION: Headquarters separated from cropland and grazing pastures.

TYPE OF OPERATION: Cow-calf -- Total about 75 animal units on all contiguous lands, 551.1 acres north of right-of-way and 707.0 acres south of right-of-way, User # 1; 106.4 acres north and 960.0 acres south of right-of-way, User #2.

LOCATION: Headquarters about 23 miles east of Glendive and one-half mile west of Wibaux County Line in Section 26, Township 15 North, Range 58 East, M.P.M., Dawson County, Station 1256+85 on Project 1 94-6 (6).

STRUCTURE TYPE: 96" round, corrugated metal pipe, 168' in length. Drainage-stockpass usage, paved invert.

SPECIFIC PROBLEMS: Dual usage necessitates a proper fencing arrangement for one of the two users, and would not allow the free movement of all stock. Although spring runoff is usually over with by the time the underpass is used, there have been early snowstorms which have plugged the stockpass to the extent that it was not usable. In one instance, a fence was cut to allow cattle access to shelter and headquarters. Two-year old unbroken horses are difficult to lead or drive through. They presently have Angus which normally balk at using the underpass; however, a dairy cow would lead them through most of the time. They indicate that since the cow died, cattle would not use the structure as readily.

The users also indicate they haul calves from the other side of the highway rather than drive them through the stockpass. Calving, branding, and feeding is done on the separated pastures to some extent during the spring season.

ADEQUACY: The user hesitated to say whether the structure would be considered adequate or inadequate, so the closest term indicated was "barely adequate". Owner has also had to drill a well on the other side of 1 - 94. Cost, including ASC (federal) participation, was about \$800.

REMARKS: This is a unique situation as it presently exists. This present highway was built in 1965 with what appears to be adequate planning and right-of-way for an additional two lanes, plus a frontage road; however, extending the 8' x 168' structure under an additional lane will greatly decrease the utility of this structure. Although no additional land or property rights may be acquired prior to four lane construction, the separated pastures most likely will suffer greater damage than originally anticipated. All rights of access were acquired during the 1965 acquisition, and the owner would therefore have no payment for subsequent damages incurred after four lane construction. Marginal utility as now exists will change to no utility after the four lanes are built.

I 94-6 (6)
GLENDIVE-WIBAUX

96" diameter x 168' long, C.M.P.
Drainage-Stockpass



NORTH ENTRANCE
Notice bedspring gate; entrance
is too wet for use at this time



SOUTH ENTRANCE
Notice drainage



Looking North from NORTH ENTRANCE
Notice trail up bank to dry ground



Looking South from SOUTH ENTRANCE
Water is seepage from stock reservoir
above the pipe.

Case Study No. 7



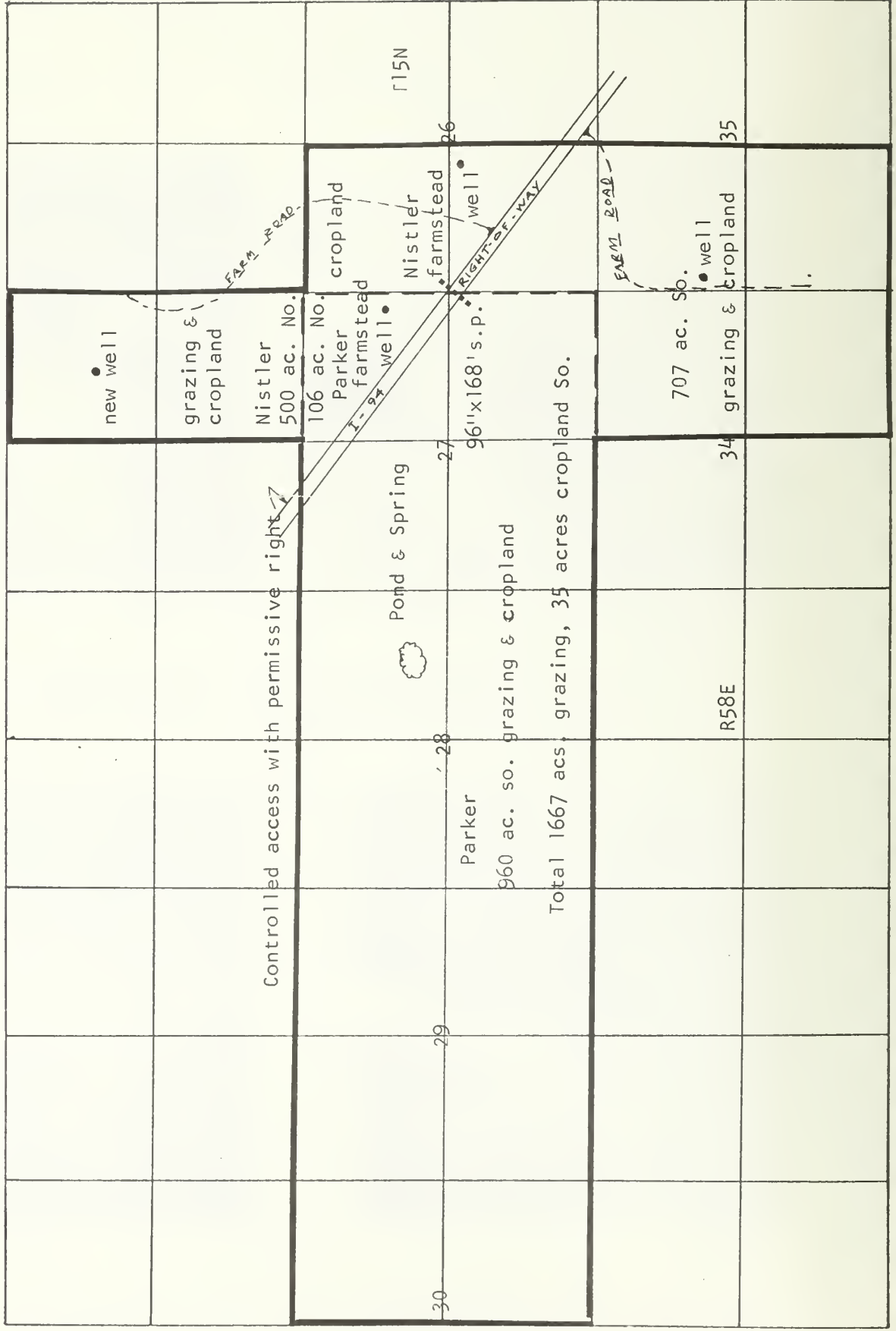
Photo taken during January, 1971; Winter photo of eight foot diameter stockpass.

DISTRICT NO. 4

OWNERSHIP PLAT

SCALE 1" = 1/2 mile Principal Severance Situation Headquarters separated from pastures

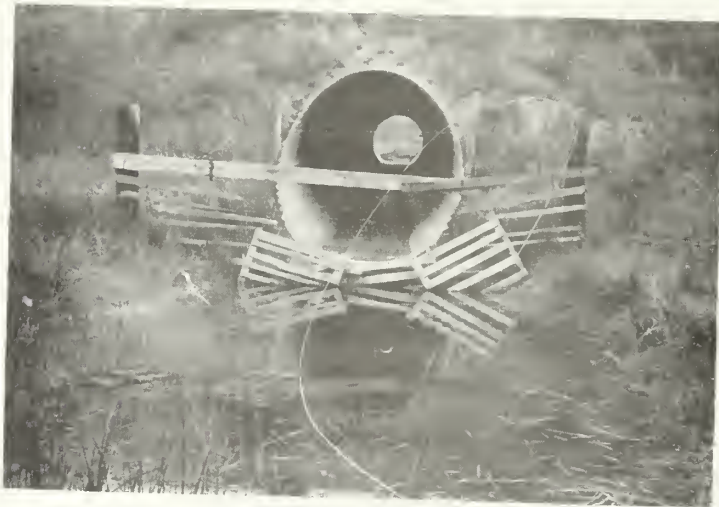
DATE 6/70 CASE STUDY NO. 7 PARCEL NO. 19 & 20 PROJECT NO. 1-94-6(6)



F 246 (11)
GLEDIVE - CIRCLE
120" X 132' Corrugated Metal Pipe
STOCKPASS - DRAINAGE



NORTH ENTRANCE
High Water



NORTH ENTRANCE
Low Water



Looking Northerly
from NORTH ENTRANCE
-160-

F 246 (11)
GLENDIVE - CIRCLE
120' x 132' long, C.M.P. Dr.-Sp.



SOUTH ENTRANCE
High Water



SOUTH ENTRANCE
Low Water

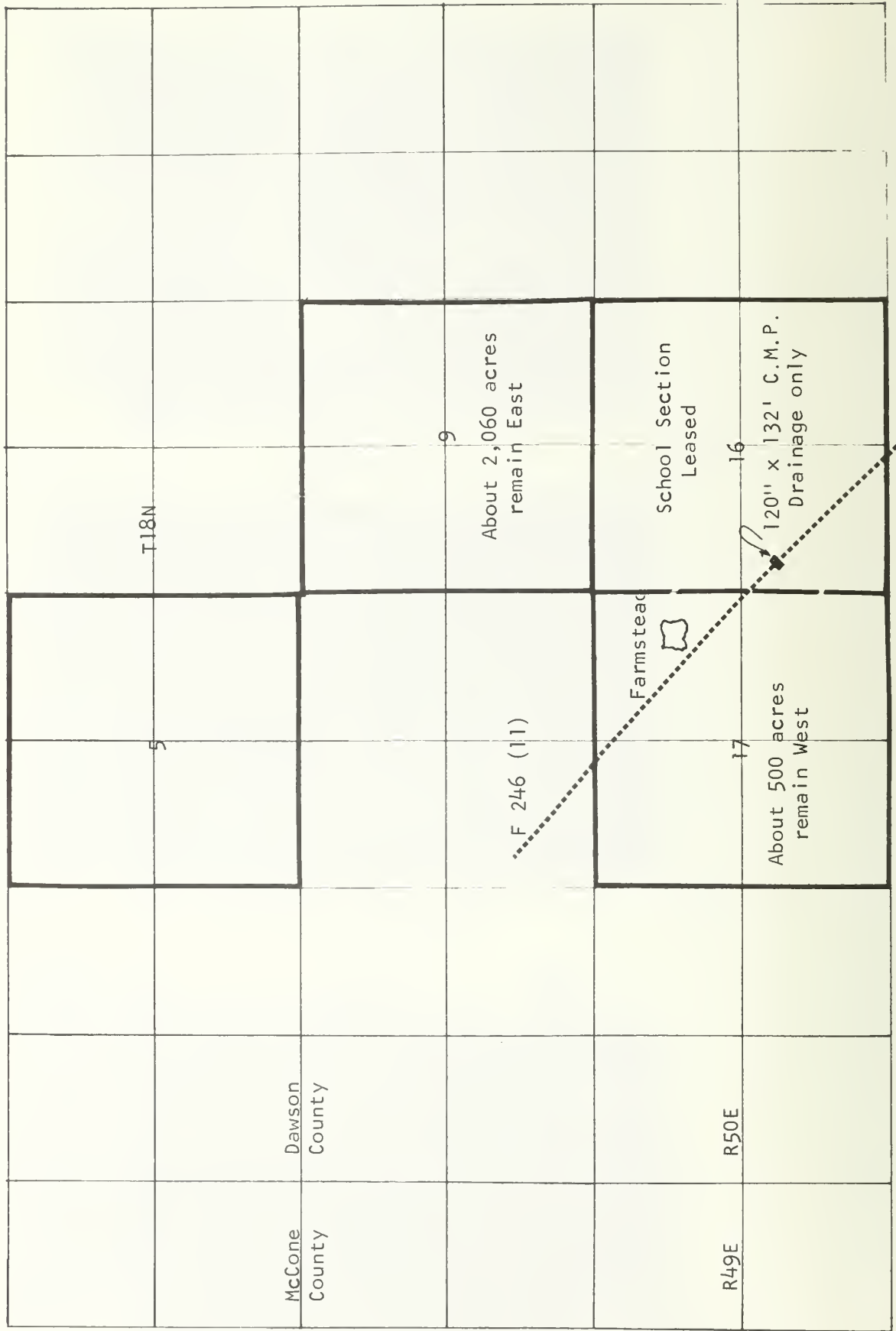


Looking Southerly from SOUTH
ENTRANCE to Drainage Area

OWNERSHIP PLAT

SCALE $1'' = \frac{1}{2}$ mile Principal Severance Situation Separated Pastures

DATE 7/70 CASE STUDY NO. 8 STRUCTURE AGE 6 yrs PROJECT NO. F 246 (11)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 11 - Non-Controlled Access

DATE OF INSPECTION: July, 1970

PRINCIPAL SEVERANCE SITUATION: Summer pasture and cropland separated from main unit.

TYPE OF OPERATION: Cow-calf - total of about 100 cows with about 30 replacement heifers held over. This is also a wool and lamb operation of 500 sheep.

LOCATION: 11.4 miles east of Circle in Section 8, Township 18 North, Range 50 East, M.P.M., Dawson County, Parcel No. 4, Station 666+47 on Project F 246(11).

STRUCTURE TYPE: 1) 72" diameter x 136' long corrugated metal pipe. Drainage pipe with 21' of fill.
2) 120" diameter x 148' structural plate pipe. Drainage pipe with 13' of fill.
3) 84" diameter x 132' structural plate pipe. Drainage-stockpass combination. The bottom is unpaved. The structure is located in a large drainage with a wide flat bottom.

SPECIFIC PROBLEMS: The intended combination drainage and stockpass is not usable due to the spring developed by the landowner. It renders the area too boggy for normal use and flows 2 to 3 inches of water from the spring. Its only use is as a drainage structure and water supply. With usage for cattle and vehicle movement of the 120" diameter drainage structure at Station 613+26, this 84" diameter structure becomes unnecessary.

There are about 1,171 acres to the north and about 2,080 acres to the south with non-contiguous leased and fee lands of 1,700 acres. The 120" structure adequately serves his needs, except the round bottom is not paved to allow a good driving surface and he drives on the corrugations. He has never driven cattle through the pipe; however, he allows free movement and curiosity usually helps more than trying to drive them through. After feeding them with his pickup, he can blow his horn and lead them any place he wants to. He also mentioned he feeds grain and cake through the structure just before snowtime.

ADEQUACY: The landowner was most cooperative with much praise for a cattle structure. His actual experience with the 84" in comparison with the 120" indicated an extreme preference for the larger 10' pipe. He does winter south of the highway where shelter and calving sheds are adequate. The drainage pipe is very adequate for his stock movement and the stockpass-drainage is unusable. This 120" structure has been in use six years for cattle movement. Winter snow does not seem to be a problem due to the wide bottom of the drainage which allows the snow to blow clear. He also uses the underpass for sheep movement, which seems satisfactory at present.

REMARKS: Obviously a drain-stockpass combination does not always serve the intended purpose. In this instance the property owner developed a spring and rendered it probably for a better use for his particular operation, as long as the 120" drain was sufficient to accommodate him. It is difficult to recommend paving in a structure intended for drainage; however, any pipe over 10' in diameter in stock country should probably be either paved or graveled to a sufficient width. This structure is also an obvious safety feature and the owner indicates this as a positive influence. He would prefer an arch or square structure to the circular because of the difficulty of driving through a round, unpaved pipe.



North End



South End

Although this is in the bottom of a drainage area, notice the wide, flat bottom for easy access, winter maintenance if necessary.



Looking North



Looking South

120' x 148' Structural Plate Pipe



North End



South End



Northerly View



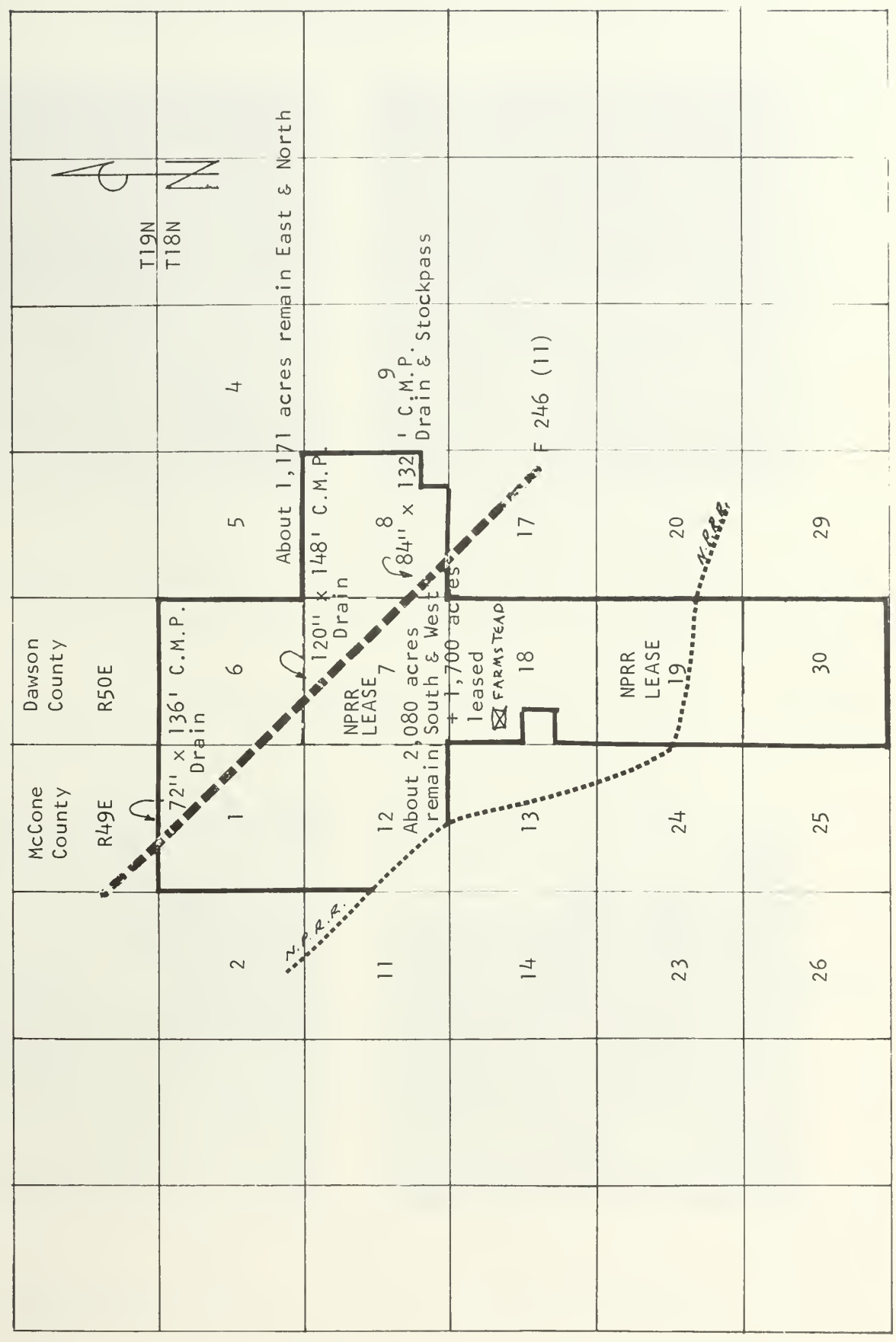
Southerly View, note
spring and swamp.

84" x 132' Structural Plate Pipe

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Separated Summer Pastures

DATE 7/70 CASE STUDY NO. 11 STRUCTURE AGE 6 yrs PROJECT NO. F 246 (11)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 12 - Non-Controlled Access

DATE OF INSPECTION: July, 1970

PRINCIPAL SEVERANCE SITUATION: Grazing pastures separated from water; 432 acres north and 494 acres south.

TYPE OF OPERATION: Cow-calf - 50 head of cows, plus 4 to 7 head of milk cows.

LOCATION: 8.6 miles SE of Lindsey, located in Section 26, Township 18 North, Range 50 East, M.P.M., Dawson County, on Project F 246 (11), Station 901+00.

STRUCTURE TYPE: 84" diameter x 176' length with 33' of fill. Actual measurements are span = 76", rise = 83" at ends. C.M.P. stockpass-drainage.

SPECIFIC PROBLEMS: After a rain, 6" to 8" of silt collects in the bottom. The landowner states the cattle will make a path through the mud as it dries. It does not stay wet for too long a period of time.

The underpass becomes quite icy in the wintertime and the landowner has some problems with snow. This does not interfere with cattle movement because he normally only pastures the north land in summer and fall. Should a big storm come along, he can move them through gates across the highway to his headquarters and shelter. The landowner has stated he has worried about a cow falling on the ice in the structure and not getting up. It has not happened yet, however.

ADEQUACY: The landowner feels the structure is adequate for this type of operation. It is settling in the center and therefore the usable height is 75' and width is 85'. He feels that this structure is not quite as good as the bridge he had before. He does not, however, have the problem of the cattle turning back when traffic is crossing the pipe as he did with the bridge. It seems some problems are offset by others, with good points and bad. The main reason he liked the bridge was that it was so much wider. The investigator saw the actual cattle reaction to a vehicle crossing a bridge when a 200 to 300 head herd were crossing under a highway bridge. The cattle spooked, turned, and scattered, and seven men on horses and one pickup driver had problems handling them.

REMARKS: The landowner would not state any suggestion for improving the structure; he felt the Highway Commission should do that. The investigator felt that more care should be taken in construction to ensure proper drainage and improve the approaches with bituminous surfacing. Also, where there are large fills as this, a heavier gauge pipe might alleviate the squash and heave (bending) problem.



NORTHERLY ENTRANCE



SOUTHERLY ENTRANCE

84" X 176' Corrugated Metal Pipe



Looking Northerly from
NORTH ENTRANCE



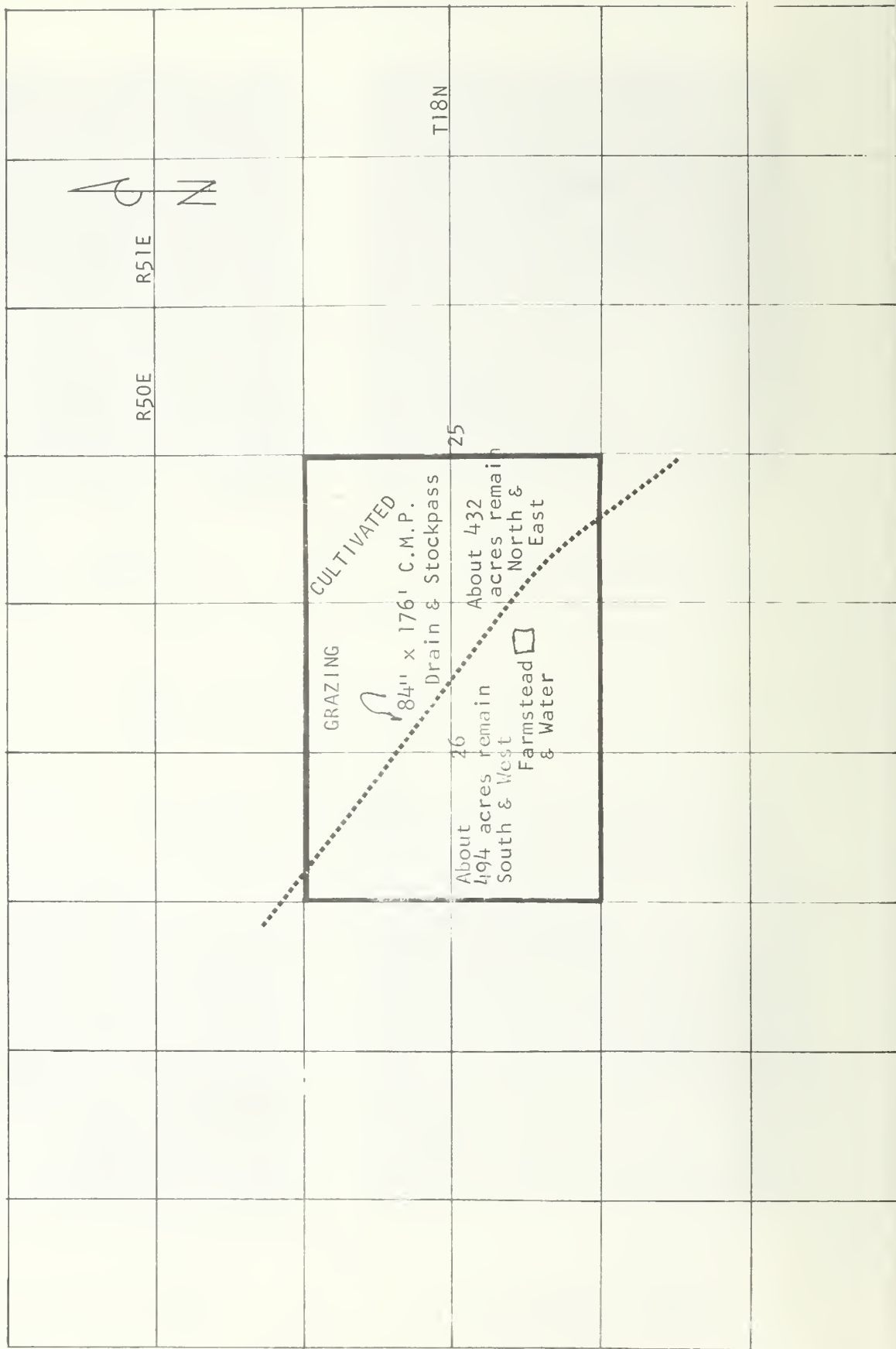
Looking Southerly
from SOUTH ENTRANCE

DISTRICT NO. 4

OWNERSHIP PLAT

SCALE 1"=1/2 mile Principal Severance Situation Grazing pastures separated from main unit & water

DATE 7/70 CASE STUDY NO. 12 STRUCTURE AGE 6 yrs PROJECT NO. F 246 (11)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 13 - Non-Controlled Access

DATE OF INSPECTION: July, 1970

PRINCIPAL SEVERANCE SITUATION: Separated grazing pastures.

TYPE OF OPERATION: Cow-calf --- about 60 animal units. 1,746 acres northeasterly and 459 acres southwesterly remaining.

LOCATION: 14.2 miles east of Circle in Section 22, Township 18 North, Range 50 East, M.P.M., Dawson County, Station 818+30 on Project F 246 (11).

STRUCTURE TYPE: 84" diameter x 162' length, corrugated metal pipe with 21 feet of fill. Combination stockpass and drain. Actual measurements are 84" rise x 76" span.

SPECIFIC PROBLEMS: The most significant problem is that the landowner is convinced it will not work, but he has not tried to use it. Physical and locational aspects are a prime consideration in his thinking. The pipe had to be placed on a skew with some change and excavation being done on the creek side in order to maintain a flow of water. The photos show the sharp creek bank on the northerly end of the structure.

ADEQUACY: Although the landowner says it is not usable, there is no way to test the adequacy without actually using the structure. However, the landowner stated that he may be surprized and the cattle would use the stockpass if he opened it up. As it sets, it is inadequate and unused.

REMARKS: There is spring or fall pasture and cropland aftermath grazing on the southwesterly 459 acres. The investigator found the creek banks to be quite sharp on the northerly end of the structure; however, it was in excellent condition with good drainage and no excessive silt collection on the bottom of the pipe. The bituminous surfacing was in good condition. He could not see why this would not work if the owner would have given it a chance.

Water in the separated pasture is a limiting factor for the grazing period. There is possibly three weeks grazing available which he can utilize during springtime if there is water in the two small dams south of the road. If not in the spring, he can utilize it with his cropland aftermath grazing with water available from Berry Creek which traverses through his land on the westerly edge. This would, however, constitute the crossing of livestock across the highway from one to three times a year.

Because this landowner was quite definite this structure absolutely would not work, he stated he should have tried for a well during negotiations instead of settling for a stockpass.

This is one of the least deteriorated structures checked, with good dry approaches and no silt deposit in the bottom of the pipe. The landowner felt a better location would have been a small draw about 500' west. The investigator noted the grade at that point was not high enough to cover the structure. The southerly approach was good; however, the northerly approach was poor because it would have been along the sharp edge of the drainage.

The only recommendations plausible in this case is a "should have done" consisting of a settlement without the structure. These situations will naturally occur because human judgement is fallible, and either or both parties of the negotiation can err in their forecast of future conditions.



NORTHERLY ENTRANCE



SOUTHERLY ENTRANCE



Looking Northerly from
NORTH ENTRANCE



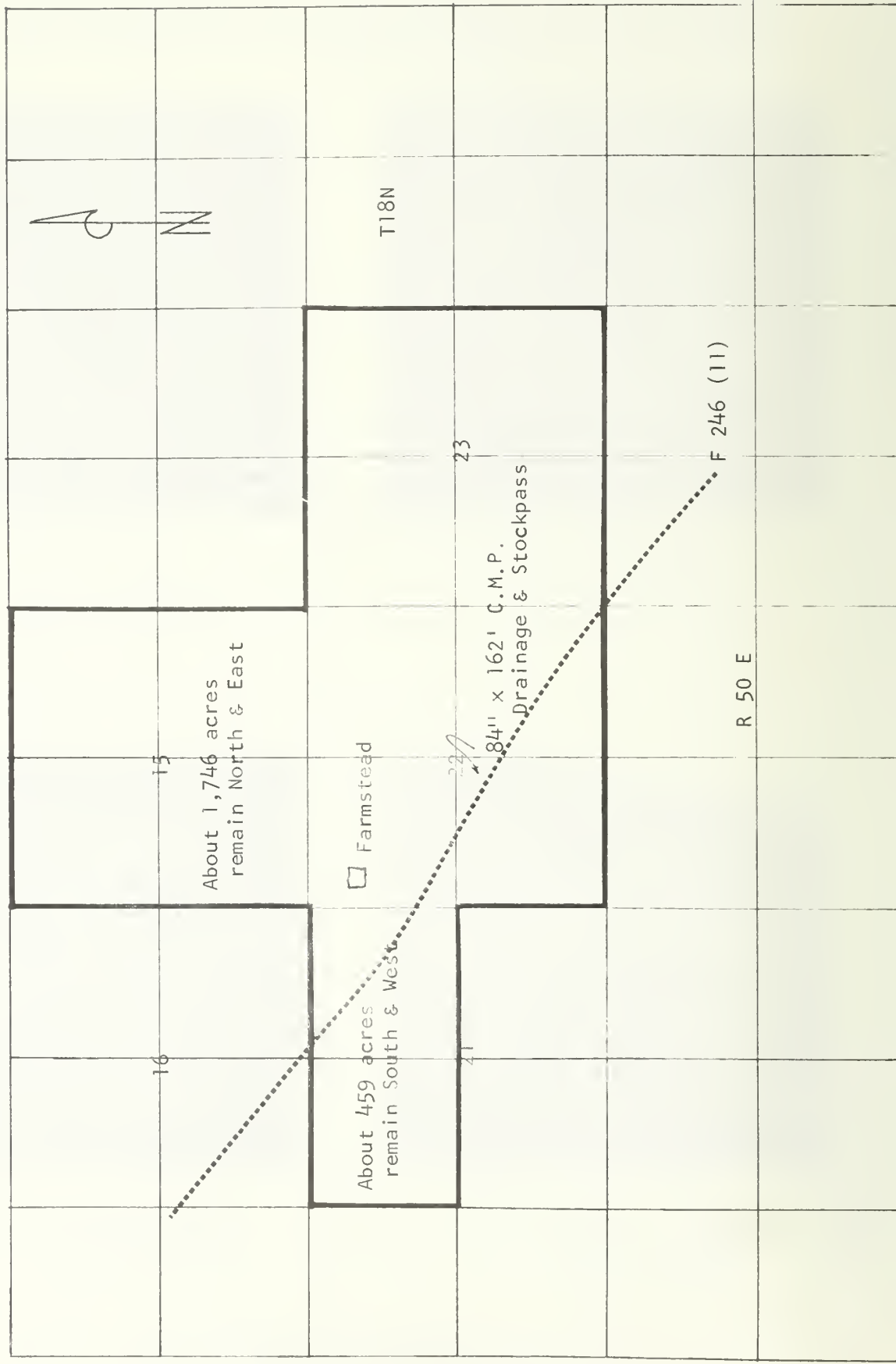
Looking Southerly from
SOUTH ENTRANCE

84" X 162' Corrugated Metal Pipe

DISTRICT NO. 4

OWNERSHIP PLAT

SCALE $1" = \frac{1}{2}$ mile Principal Severance Situation Separated grazing pastures
DATE 7/70 CASE STUDY NO. 13 STRUCTURE AGE 6 yrs PROJECT NO. F 246 (11)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 14 - Non-Controlled Access

DATE OF INSPECTION: July, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures, (summer use).

TYPE OF OPERATION: This was a cow-calf operation -- approximately 60 head and one milk cow. He has since sold his cows and is leasing the pasture and hiring his crop put in and harvested. 1,264 acres south and 426 acres north of right-of-way.

LOCATION: 6 miles southeast of Lindsay in Section 4, Township 16 North, Range 53 East, M.P.M., Dawson County, Station 1745+07 on Project F 246 (14).

STRUCTURE TYPE: 108" diameter x 170' long, round corrugated metal pipe with about 18 feet of fill. Combination drain and stockpass.

SPECIFIC PROBLEMS: Poor drainage, 6 inches of silt and water collect in structure. Weeds also blow into structure which he has to clean out; the poor drainage leaves water standing in the bottom. However, his cows still used it and did not seem to mind the water because it was quite shallow.

ADEQUACY: It had been adequate for his type of operation when he had cattle. This was the best possible location because there was a nearby bridge under the railroad which also bisects the property. The structure has been in use four years. Although mud and weeds created a problem, the structure would be considered adequate for the period it was in use. The investigator said this pipe was in good condition with no heaving or squashing noticeable.

This structure was harder to get cattle through than a former bridge had been. The landowner used a very gentle bull and grain to help get the cows through. He would lead the bull through while the cows were driven to the structure. He also had a milk cow who was a great help in stock movement. After his cows were used to the structure, his problems diminished somewhat.

REMARKS: This structure was originally designated a drainage-stockpass; however, it has either settled or was not installed properly. Water stands in the south end for about 25 feet. There is pavement in this structure so the bottom does not constitute a problem. Terrain is rolling and accessible. Therefore, the only recommendation would be to inspect carefully the design and construction of a combination drainage-stockpass structure of this size and type.

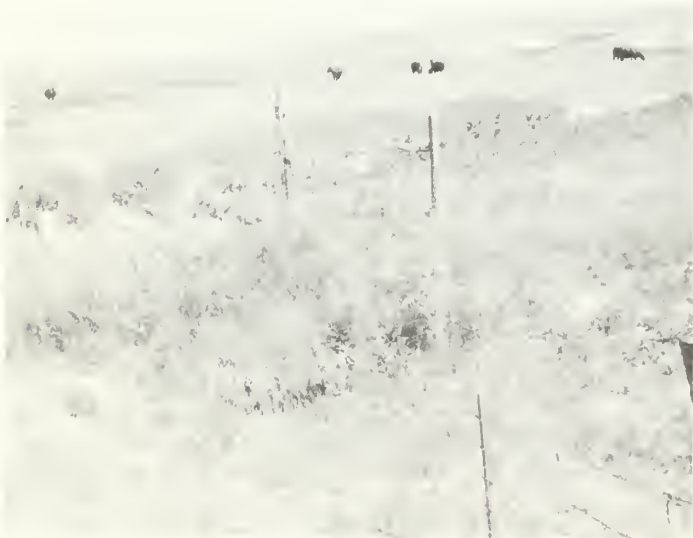


NORTH ENTRANCE



SOUTH ENTRANCE

108" X 170' Corrugated Metal Pipe



Looking North from
NORTH ENTRANCE

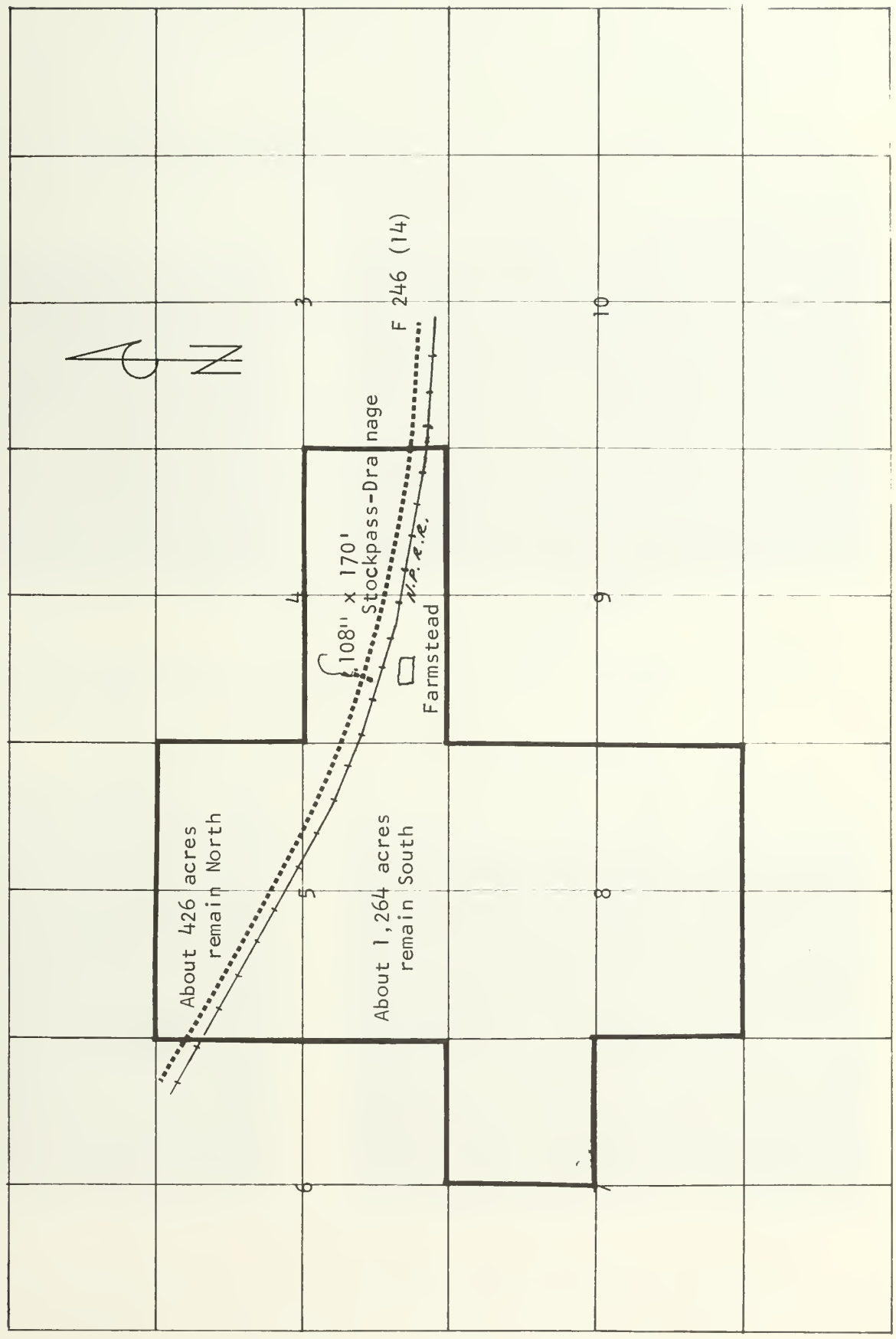


Looking South from
SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE $1\frac{1}{2}$ mile Principal Severance Situation Separated pastures (summer use)

DATE 7/70 CASE STUDY NO. 14 STRUCTURE AGE 4 yrs PROJECT NO. F 246 (14)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 46 - Non-Controlled Access

DATE OF INSPECTION: September, 1971

PRINCIPAL SEVERANCE SITUATION: Separation of summer pastures and aftermath grazing. About 239 acres remain east and 157 acres remain west.

TYPE OF OPERATION: Cow-calf -- about 50 to 60 head of cows and keeps better heifers for replacement.

LOCATION: Six miles north of Medicine Lake, located in Section 25, Township 33 North, Range 55 East, and Section 30, Township 33 North, Range 56 East, M.P.M., Sheridan County, Station 331+96 on Project F 193 (10).

STRUCTURE TYPES: 72" diameter and 88' long, C.M.P., drainage-stockpass with about 2' of fill over pipe. Actual measurement averages 68½" in diameter.

SPECIFIC PROBLEMS: Only problem mentioned was that the snow plows occasionally fill the east entrance with snow, as do the drifting winds; however, the lessee of the property usually has his cattle home by this time. The highway maintenance crews have used oil mix on the east end along the pipe edge to stop washing and gravel on the south side of the west end of the structure. Note under "Adequacy" for solution to a field access problem.

ADEQUACY: The lessee felt that the structure was adequate for his needs. He had to build a cattle lane 15' wide on the west side of the highway along the drainage, for moving cattle to pasture. This is used during the time when his crops are still in the field unharvested. The location is the only one available for the structure.

REMARKS: Due to the fact this was intended to be a drainage pipe, the concrete wing walls were to stabilize the entrance and prevent eroding at either entrance. This has worked well, and possibly because of this holding effect, has allowed the entrance to grass over and eliminate the pond, or pooling, that often takes place at an eroded low point. The underpass is quite satisfactory for cattle usage and has a good footing through the pipe. Pavement on the east end prevents inlet erosion and the backslopes are grass covered. Note the wire tied to the bolt holes in the pipe ends. In many cases, this appears to be the most practical wing fencing solution.

F 193 (10)
MEDICINE LAKE NORTH

72" x 88' Corrugated Metal Pipe
Combination Stockpass Drainage



EAST ENTRANCE
Note concrete stabilization



WEST ENTRANCE
Note concrete stabilization



Looking easterly from EAST ENTRANCE



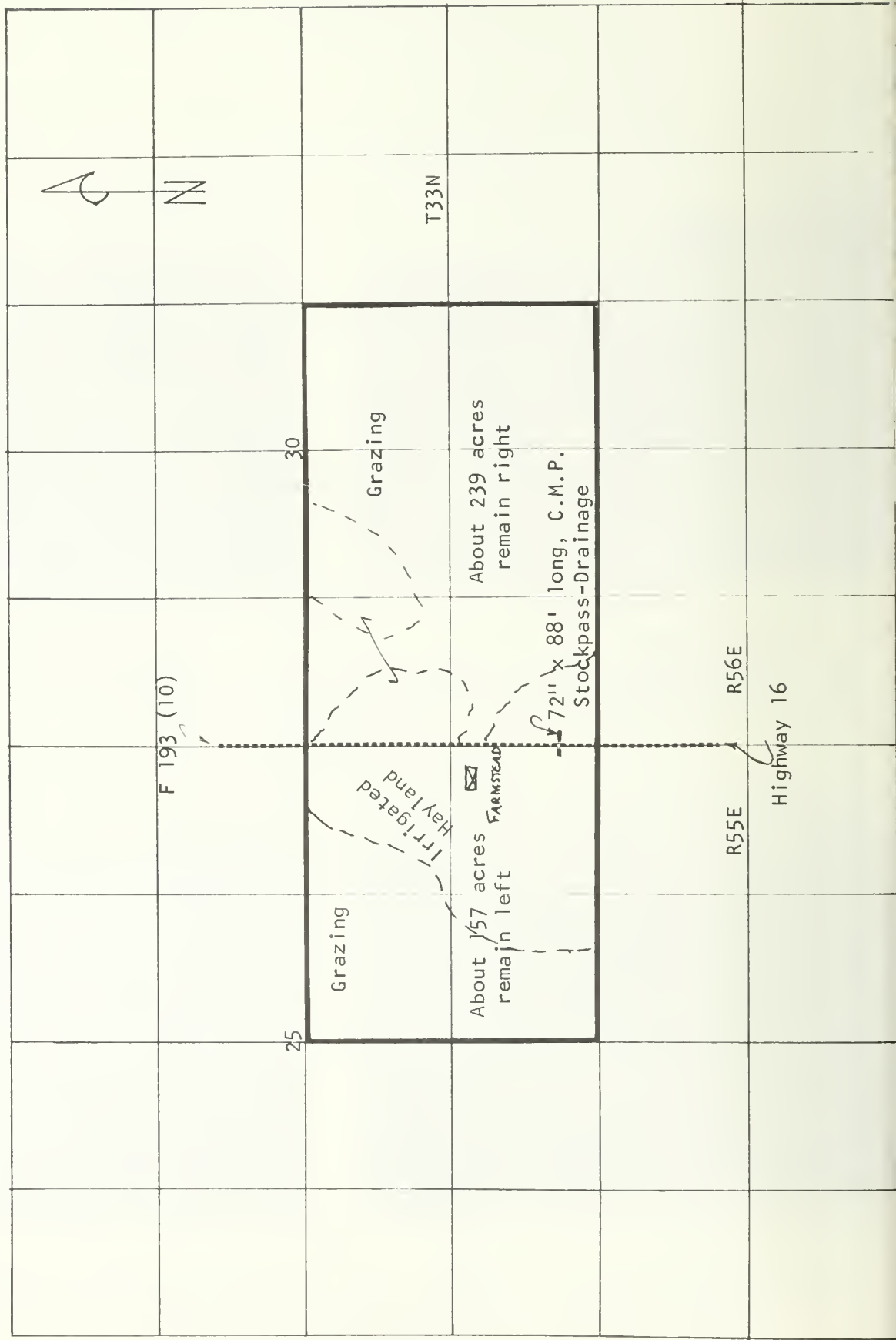
Looking westerly from WEST ENTRANCE

DISTRICT NO. 4

OWNERSHIP PLAT

SCALE 1"=1/4 mile Principal Severance Situation Separation of summer pastures & aftermath grazing

DATE 9/70 CASE STUDY NO. 46 STRUCTURE AGE 7 yrs. PROJECT NO. F 193 (10)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 47 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separated summer pastures; about 900 acres remain north and 2,112 acres remain south.

TYPE OF OPERATION: Cow-calf --- approximately 150 to 160 cows and keeps good replacement heifers.

LOCATION: Two and one-half miles east of Scobey, located in Section 7, Township 35 North, Range 58 East, M.P.M., Daniels County, Station 143+50 on Project F 251 (10).

STRUCTURE TYPE: 5'10" span x 6'6" rise x 78' long, C.M.P., Type "A" stockpass-drainage. Actual measurement is 5'6" span x 6'6" rise.

SPECIFIC PROBLEMS: Only problem mentioned was initial usage. The owner used pellets and boiled feed to move the cattle through the first time and he has had no problems since. He would, however, prefer a wider structure. He mentioned that when using feed to move his cattle through, that an old cow would turn around and fight the other cattle back into the pipe, and when they turned around in the pipe, they sometimes fell and cut themselves on the bolts or turned up lame. For this reason, a wider walking surface was desirable.

ADEQUACY: The landowner is very pleased with the structure, and it is very adequate for his operation. His only opinion, other than favorable, is that these structures could be built a little wider. He does not use this structure for cattle in winter; however, he has noted that it does not fill with snow. He said there is a natural wind tunnel in the area and it blows the snow clear. He pastures from late June until late September north of the right-of-way. This structure is considered "conditionally adequate".

REMARKS: Note the board wing fencing into the stockpass. This is a very usable and desirable situation, based on what will and will not work for wing fencing. Perhaps a larger structure could have been justified on this large a ranching operation.

Design "A" 5'10" span x 6'6" rise x 78'L
Corrugated Metal Pipe
Stockpass-Drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking northerly from NORTH ENTRANCE

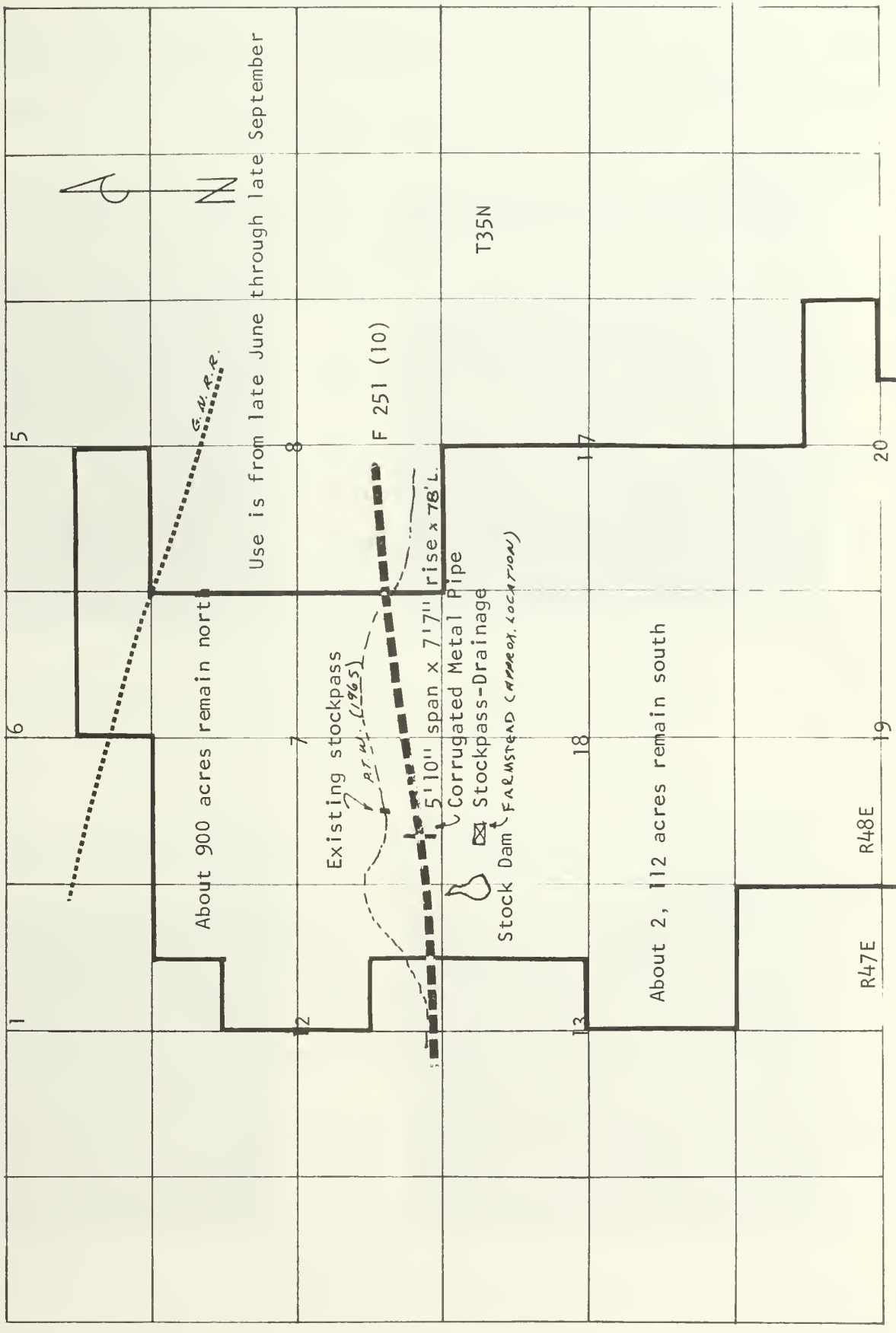


Looking southerly from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1/2 mile Principal Severance Situation Separated summer pastures

DATE 9/70 CASE STUDY NO. 47 STRUCTURE AGE 4 yrs PROJECT NO. F 251(10)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 48 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of aftermath grazing meadows; about 100 acres remain south and 400 acres remain north.

TYPE OF OPERATION: Cow-calf - this is a rather diversified operation, depending on feed and range conditions. Between 400 and 700 head of cattle. About 400 to 450 of these are cows with the balance feeders. He sometimes feeds out his own calves for sale at the Glasgow market. Prices tend to govern his sale and feeding program, along with buyers' demand on weight of calves wanted. (Typical larger type of ranching diversification).

LOCATION: About three miles west of Hinsdale, located in Section 26, Township 31 North, Range 35 East, M.P.M., Valley County, Station 2041+5 on Project F 148 (7).

STRUCTURE TYPE: 5'10" span x 7'7" rise x 80' long, C.M.P., Type 'B' stockpass-drainage. Actual measurement 5'5" span x 7'4" rise.

SPECIFIC PROBLEMS: The owner used the stockpass for the first time last winter with his feeding operation. He had to build holding pen lanes into both ends of the pipe. The north entrance is not fenced as effectively as the south entrance. The approaches are generally muddy with silt over the oil bottom in the stockpass, with about 14" accumulating from time to time. Heavy rain or irrigation runoff helps wash some of this out. This does not prove to be a deterrent for cattle movement unless the silt becomes too deep. This stockpass is lower than the irrigated land and fills in with snow which the landowner cleans out by hand and with a farmhand vehicle, if he needs to use it. This is the only feasible location.

The owner has never used the stockpass for cows, only young cattle, and he has to have a winged holding pen for the movement.

ADEQUACY: The landowner stated it is better than nothing. He felt it was possibly adequate for his needs, although it could be wider. He found that the young cattle, once used to the stockpass, move fairly readily through it even when there is a buildup of silt inside the stockpass. They were not displeased with the structure as this is all that could be put in and at the present location. All problems that they have are problems they knew they would have and would have to live with. This structure is considered adequate.

REMARKS: Since acquisition of right-of-way, he has leased more land and purchased some to provide a living for two families.

The only recommendation here is to, perhaps, provide a better stabilization in the drainage area where possible. In many of these cases, drainage runoff does allow this. It is not likely he ever expected a large enough structure to accommodate the whole herd, since only 100 acres remained south of the right-of-way.

F 148 (7)
HINSDALE WEST

Type "B", 5'10" span x 7'7" rise x 80' L
Corrugated Metal Pipe
Combination Stockpass-Drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking northerly from NORTH ENTRANCE

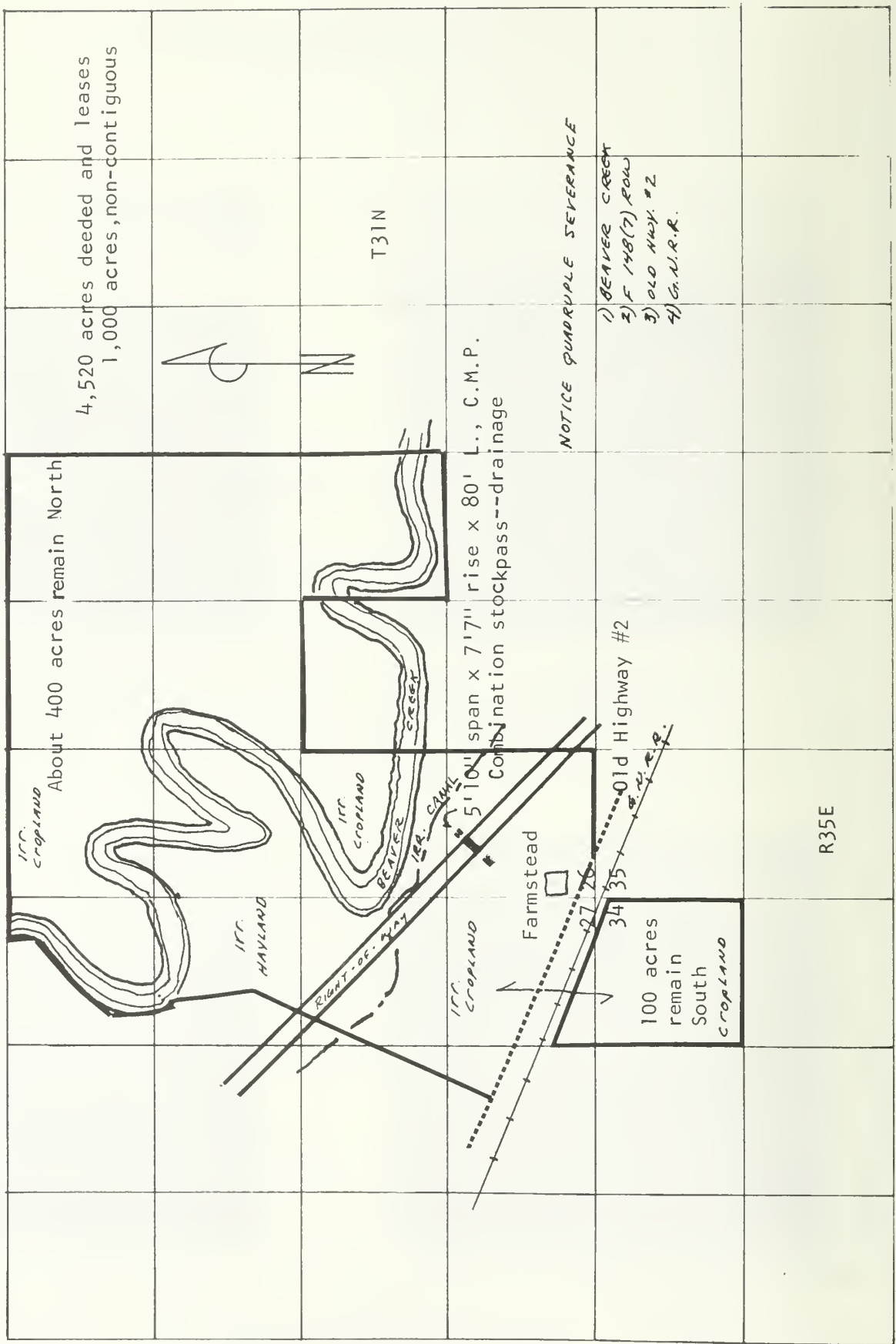


Looking southerly from SOUTH ENTRANCE
Path towards building and feedlot

OWNERSHIP PLAT

SCALE $1" = \frac{1}{4}$ mile Principal Severance Situation Separation of aftermath meadows

DATE 9/70 CASE STUDY NO. 48 STRUCTURE AGE 1 yr PROJECT NO. F 148 (Z)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 49 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of summer pastures. About 3,458 acres deeded and 320 acres leased remain west and 509 acres deeded and 360 leased remain east.

TYPE OF OPERATION: Cow-calf; 150 to 175 head of cows and holds replacement heifers.

LOCATION: Nine miles east of Malta, located in Section 30, Township 31 North, Range 31 East, M.P.M., Phillips County, Station 420+00 on Project F 142 (8)

STRUCTURE TYPE: 5'10" span x 6'6" rise x 92' in length, C.M.P., Type "A" combination drainage-stockpass with about 2' of cover. Actual measurements are 5'6" span x 6'6" rise.

SPECIFIC PROBLEMS: The owner stated he had trouble moving cattle through this pipe the first few times. He then built a 115' x 132' holding pen and, after letting the cattle stand for four to six hours and "mother up", he has had no further trouble. He says they have used the structure with no problems. The owner has tried to drill two wells north of the new road and both came in dry. He has since dug a pit in an old lake bed that furnishes a good water supply.

ADEQUACY: The owner considers it excellent for his needs; very adequate and no complaints. He likes the location and has used the structure three years for summer pasture, from the middle of June to the first of October. He has only praise for the structure. This, therefore, is considered an adequate structure.

REMARKS: It is well to note the holding pen cured the difficulties first encountered. Size, shape, and type of pen should be analyzed separately for each ranching operation confronted with this problem.

Type "A", 5'10" span x 6'6" rise x 92'L
Combination Stockpass--light drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE
Showing the 115'x132' holding pen

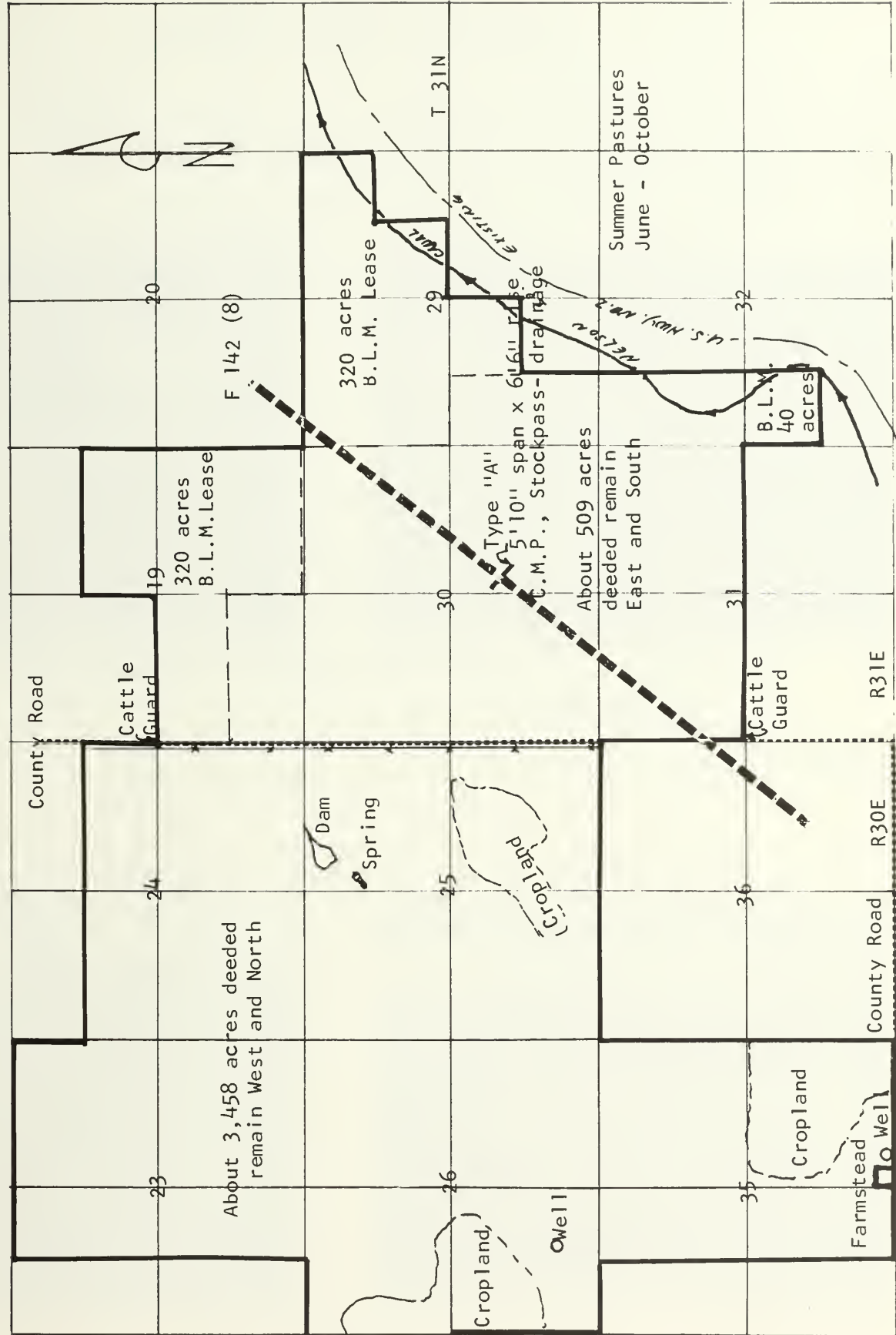


Looking South from SOUTH ENTRANCE
Level terrain

OWNERSHIP PLAT

SCALE 1"=1/2 mile Principal Severance Situation Separation of summer pastures

DATE 9/70 CASE STUDY NO. 49 STRUCTURE AGE 3 yrs. PROJECT NO. F 142 (8)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 50 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of summer pastures.

TYPE OF OPERATION: Cow-calf -- approximately 450 head of cows plus replacement heifers.

LOCATION: Thirty miles north of Flowing Wells, thirty-two miles south of Fort Peck, located in Section 12, Township 22 North, Range 43 East, M.P.M., McCone County, Station 1633+24 on Project F 315 (18).

STRUCTURE TYPE: 84' diameter x 124' long, C.M.P., intended as stockpass-drainage, but used only as drainage. Actual measurement is 76". About 15' of cover on this pipe.

SPECIFIC PROBLEMS: The user feels the pipe is too small and he cannot get his cows through. Also, the bottom of the drainage tends to be very soft and muddy, except in extreme dry seasons. He stated his cattle are quite wild and absolutely will not use or be forced into the pipe. He said too that traffic spooks the cattle that he tried to force through it, so he gave up and fenced it off. Six inches of water presently stands in the bottom of the drainage and pipe. Terrain is brushy, steep, with difficult access. The lessee has adapted different management procedures on his pastures. The underpass is snowed in during the winter because the sharp drainages fill in first with blowing snow. He moves down highway surface to different pastures.

ADEQUACY: Inadequate, both from user's and investigator's point of view. Physical access and size seems to be major deterrents to use.

REMARKS: A larger arch-type pipe was suggested as having more utility than present structure, provided it was located in a more level and open location. It appears primary emphasis at time of installation was drainage, as evidenced by the location.

F 315 (8)
FORT PECK-FLOWING WELLS

84' x 124' long, C.M.P.
Drainage Only



EAST ENTRANCE



WEST ENTRANCE



Looking East from EAST ENTRANCE



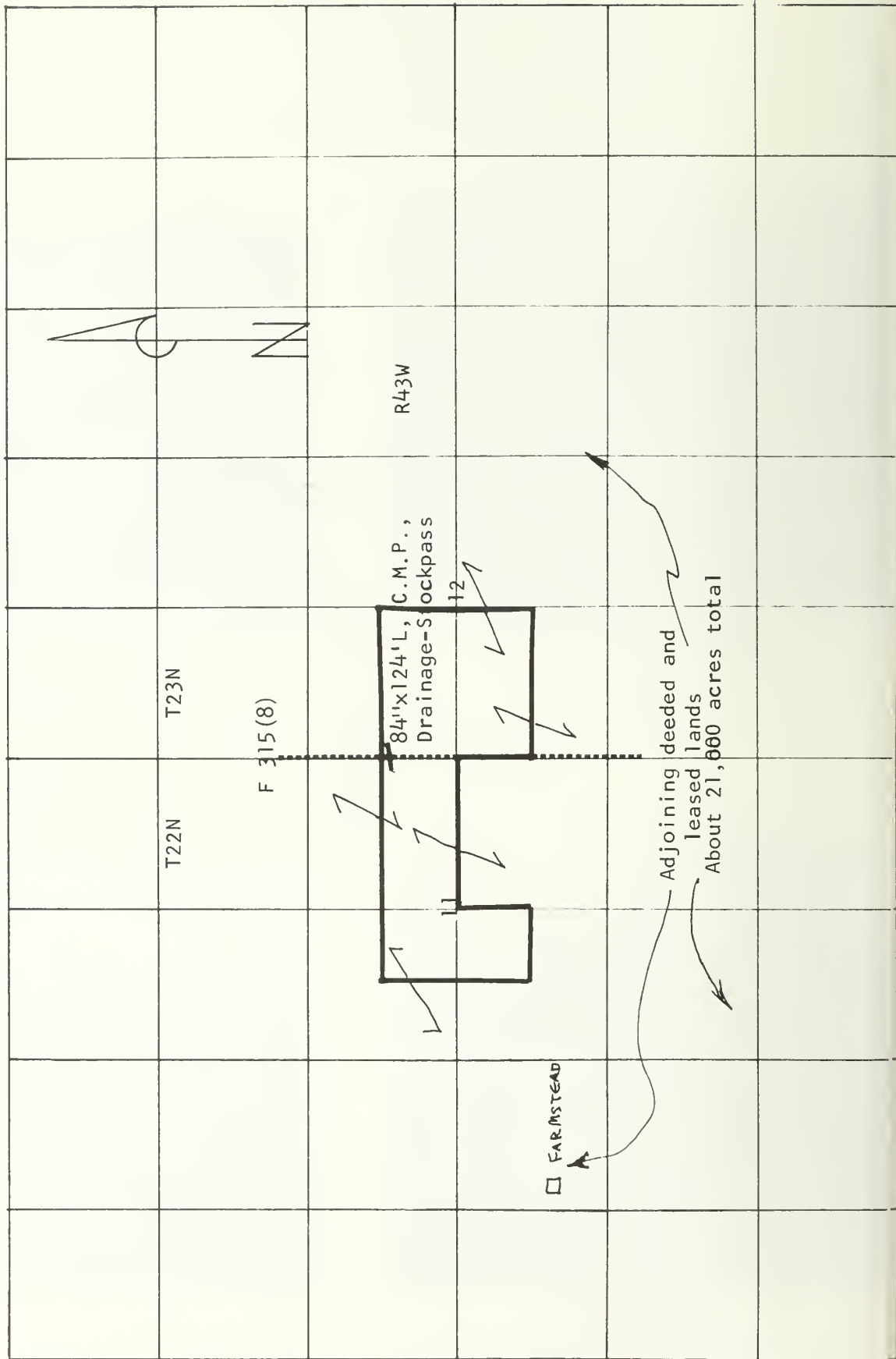
Looking West from WEST ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1/2 mile Principal Severance Situation Separation of summer pastures

DATE 10/5/70 CASE STUDY NO. 50 STRUCTURE AGE used 1st 7 yrs. old; 2 years

PROJECT NO. F 315(8)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 51 Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of pastures, about 400 acres remain north and 1,005 acres remain south.

TYPE OF OPERATION: Cow-calf -- owner normally runs 300 to 400 head and sells calves.

LOCATION: About six miles east of Culbertson, located in Section 33, Township 28 North, Range 57 East, M.P.M., Roosevelt County, Station 1350+00 on Project F 84 (27).

STRUCTURE TYPE: 6'6" rise x 5'10" span x 150' long, C.M.P., drainage-stockpass with about 3 to 4 feet of cover.

SPECIFIC PROBLEMS: There is no skew; however, there is little or no grade in the pipe, making for poor drainage. It is generally wet or full of water, 1½ feet of water in pass at date of inspection, which is not an unusually wet time of the year. This is primarily due to a spring-fed reservoir which drains through this pipe into the bottoms, which lie south of the Great Northern Mainline. The owner runs a few head of horses which will not go through this pipe at all. During snow storms, the pipe blows in solid. The north side is the worst. In that the owner uses the pipe in spring, he shovels the snow out. He sometimes finds it easier to truck bulls and calves, rather than use the snow-clogged underpass. The pipe generally has ice in the bottom. The owner then cuts through the ice, gets water to run over the ice and then scatters the straw on wet ice. This freezes, and the next day the bulls go through, walking on the straw-matted ice. He finds that his cattle will not cross the blacktop at all, which fact he attributes to the smell.

ADEQUACY: The owner is very happy he has the pipe he does, although he feels the pipe should be bigger, or at least large enough for a horse to walk through. There is considerable grief connected with using the pipe because of the water and ice problem in the bottom. He does feel, however, this is still better than trying to cross the pavement so many times. The location was considered to be O.K.; however, in view of accessibility problems, the owner would have liked a drainage pipe beside to carry the reservoir drainage water. He has changed some fence lines and built the chutes on both ends of the pipe to a total cost of about \$600. The pipe will have to be considered adequate in view of its positive and negative features.

REMARKS: There was an obvious need of two structures at this location. The railroad bridge is also used as a combination structure and drainage. A dual use situation would not help much due to the same situation existing at the railroad bridge.

F 84 (27)

CULBERTSON EAST

Type "A", 5'10" span x 6'6" rise x 150'L
Corrugated Metal Pipe
Combination Stockpass-Drainage



NORTH ENTRANCE
Note water in stockpass



SOUTH ENTRANCE
Note water in stockpass



Looking North from NORTH ENTRANCE

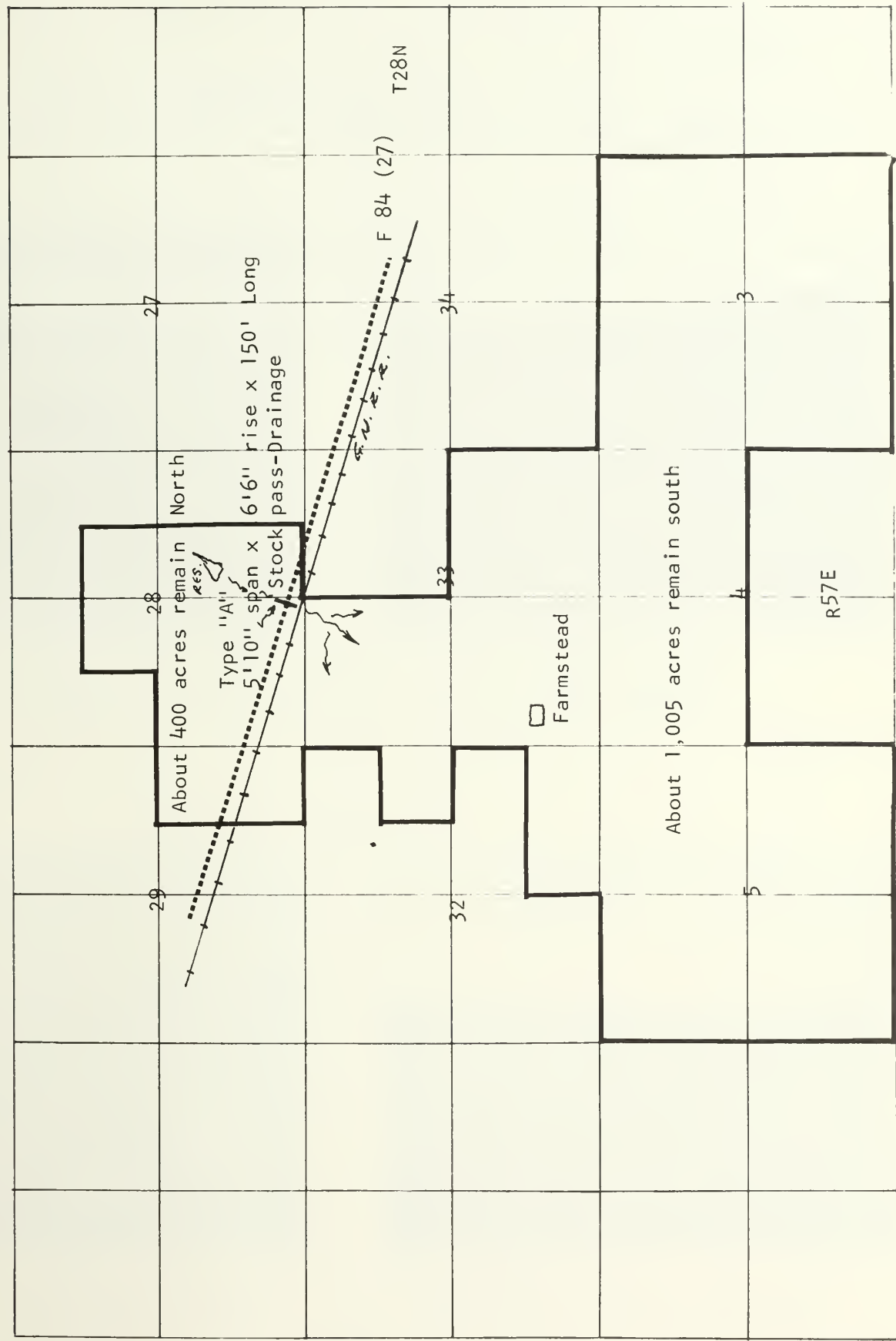


Looking South into stockpass fencing
from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1" = 1/2 mile Principal Severance Situation Separation of pastures--registered polled hereforads

DATE 9/70 CASE STUDY NO. 51 STRUCTURE AGE 13 yrs PROJECT NO. F 84 (27)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 52 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of well, on 18 acres, from headquarters.
About 1,129 acres remain south.

TYPE OF OPERATION: Normally, landowner runs 100 head of cows and one horse.

LOCATION: East of Fallon in Section 13, Township 13 North, Range 53 East, M.P.M.,
Prairie County, Station 44+80 on Project S 406 (2).

STRUCTURE TYPE: 5'10" span x 6'6" rise x 160' long, Type 'B' stockpass-drainage.
Actual measurements are the same with about 2' of cover over pipe.

SPECIFIC PROBLEMS: The only thing mentioned was the snow situation, where the north
side generally blows in badly. The owner does use the pasture in early
spring and cleans out any snow. He does not consider this a problem,
however. There has been gravel put in the bottom of the pipe several
times. Erosion is not evident.

ADEQUACY: The landowner appears to be completely satisfied with the stockpass and
project. The location is the most natural. This structure is con-
sidered adequate.

REMARKS: The structure appears adequate and well used, possibly because of the stock
well and small amount of acreage remaining north of the right-of-way.
It was, however, fenced off at time of investigation.

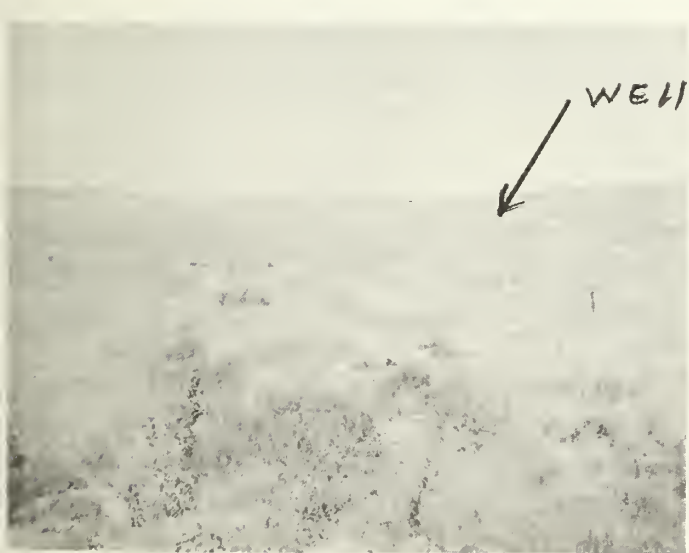
5'10" span x 6'6" rise x 160' long
Corrugated Metal Pipe
Type "A" Stockpass-Drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

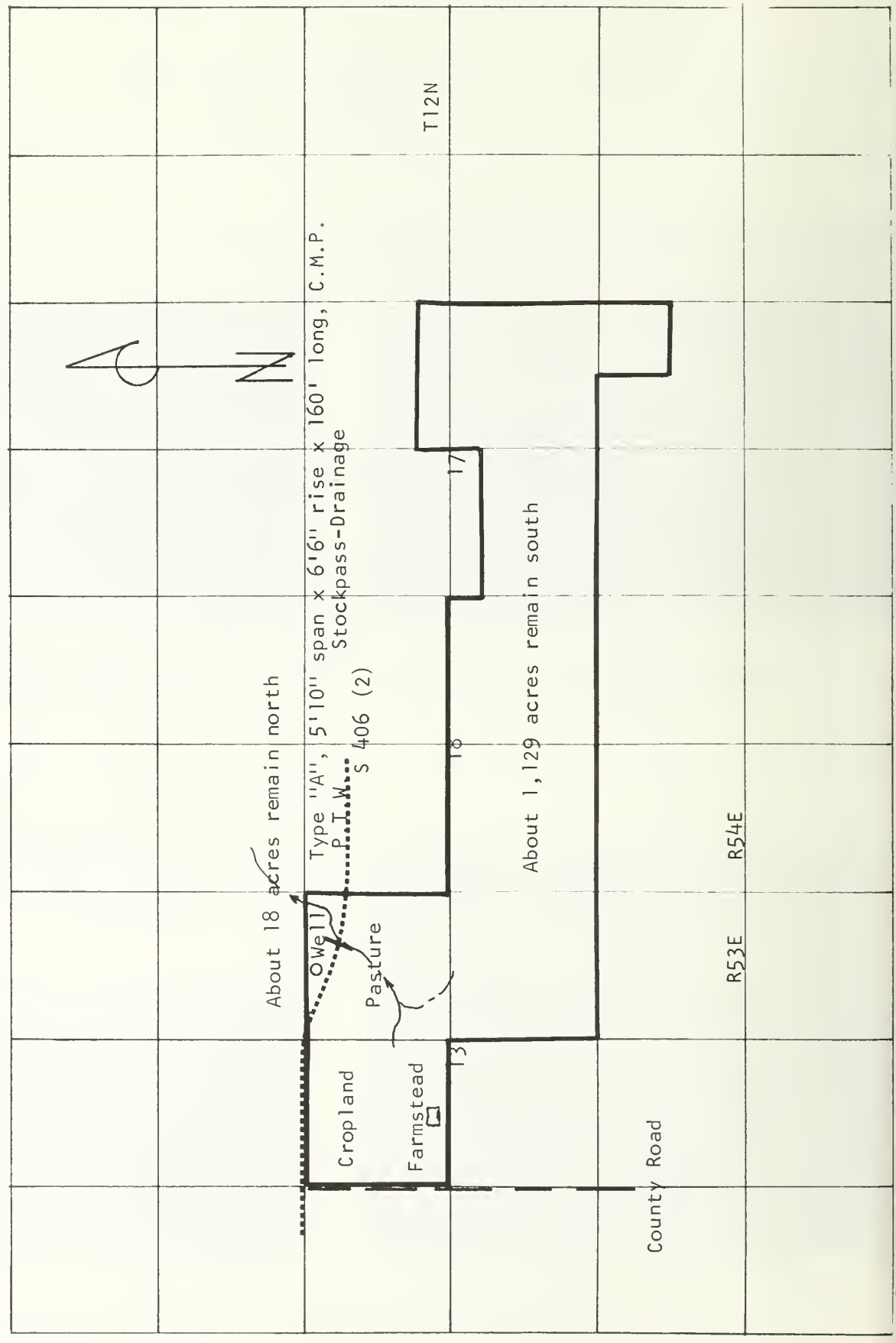


Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1/2 mile Principal Severance Situation Separation of well on 18 acres from headquarters

DATE 9/70 CASE STUDY NO. 52 STRUCTURE AGE 4 years PROJECT NO. S 406 (2)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 54 - Controlled Access With
Permissive Right

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of grazing pastures; about 29 acres remain north and 282 acres remain south.

TYPE OF OPERATION: Cow-calf --- the number of which was unavailable; however, he also carries some yearlings. This is a fairly small ranching unit.

LOCATION: About seven miles west of Wibaux, located in Section 36, Township 15 North, Range 58 East, M.P.M., Wibaux County, Station 12+06 of Project 1 94-7 (2).

STRUCTURE TYPE: 108" diameter x 212' long, C.M.P., stockpass-drainage with about 20' of cover. Actual measurement is the same.

SPECIFIC PROBLEMS: Stock movement was not a problem because stock were used to going through another structure. He has since leased the adjoining East $\frac{1}{2}$ of Section 36, to add on. It appears to make the present location somewhat difficult for use on the western edge of the pastures. Both entrances blow in badly during snowstorms, the north worse than the south. The lessee finds it generally cannot be used after about Christmas time, because of this. There is noticeable bulging due to length and other factors probably attributable to installation.

ADEQUACY: The owner would have preferred a squash pipe. This 9' pipe does have pavement in the bottom of the pipe and it is located in a drainage. There is insufficient information to determine the adequacy.

REMARKS: The underpasses in this area are generally quite long, have paved surfaces, and are combination drainage-stockpass or strictly intended for drainage use. This put the majority of them at the base of deep fills and consequently they are quite long structures. This hampers the utility of them and most of the users on this stretch of highway have found them less than adequate.

194-7 (2)
WIBAUX-WEST

108' x 212' long, C.M.P.
Drainage-Stockpass



NORTH ENTRANCE; Notice bulge



SOUTH ENTRANCE; Notice bulge



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

Case Study No. 54



North Entrance, January 1971. Snow has drifted this 9' diameter x 212' long stockpass.

OWNERSHIP PLAT

SCALE 1"=1/4 mile

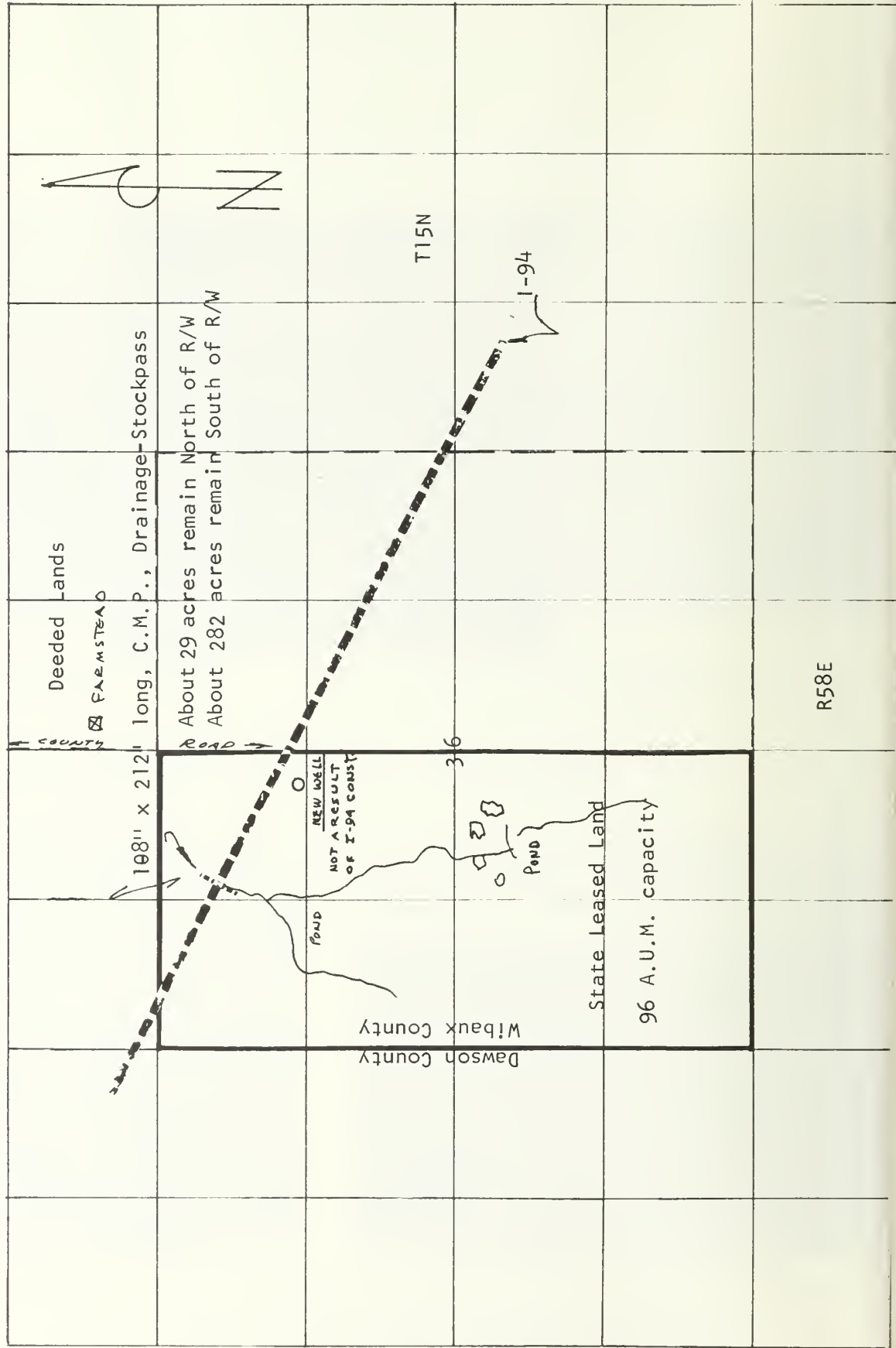
Principal Severance Situation Separation of grazing pastures

DATE 9/70

CASE STUDY NO. 54

STRUCTURE AGE 7 yrs

PROJECT NO. 1 94-7 (2)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 55 - Controlled Access With Temporary Right of Access DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of grazing pastures; about 1,107 acres remain north and 1,002 acres remain south.

TYPE OF OPERATION: Cow-calf -- runs 200 head of cows. He moves them from south side late in fall to the north side for wintering. He also runs 300 ewes on north side.

LOCATION: About 10 miles east of Glendive, located in Section 5, Township 15 North, Range 57 East, M.P.M., Dawson County. Station 697+15 on Project 1 94-6(6).

STRUCTURE TYPE: 96" diameter x 92' long, C.M.P., combination stockpass-drainage, with about $1\frac{1}{2}$ ' to 2' of cover.

SPECIFIC PROBLEMS: There is very little slope, which does not allow drainage to flush the manure out of the pipe (see top photo). The pipe has settled in the center so there is a low spot. Pipe is misshapen to 7'6" span x 9' rise from the original 8' diameter, which possibly indicates side compression. It is located on a down-grade roadway with very little cover, which may affect original designed measurements depending upon durability of roadway; or, it may be used as a shelter by cattle in summertime, accumulating manure from the numbers of cattle, and changing the shape of the pipe slightly because of weight distribution. Snow occasionally blows both ends of the pipe full. Rather than fight this, the owner runs stock west about one mile, under an interstate bridge, and back.

ADEQUACY: The owner feels the pipe should be larger and perhaps have been a squash pipe for use with a pickup. Horses move through the pipe easily but he has never tried to move his sheep through. He has had to build new corrals on the south side at a cost of \$500. He is also planning to develop springs or a well on the south side. This structure is considered barely adequate.

REMARKS: This appears to be a heavily used stock structure. Manure builds up along with drainage silt, and has to be cleaned out periodically. There are no practical machines to do this for an 8' pipe, so it is all done by hand. If the user must also clear this of snow to use it, it makes the underpass adequate only because of the maintenance by the user. The owner had a 60" pipe under the old highway, so his cattle and horses were used to using a stockpass, although somewhat shorter in length.

I 94-6 (6)
GLEN DIVE-EAST

96' x 92' long, C.M.P.
Stockpass-Drainage



NORTH ENTRANCE, looking towards
Southeast; Notice fill material
cleaned out of pipe



NORTH ENTRANCE: Notice pipe is mis-
shapen



SOUTH ENTRANCE



Looking Northwest from NORTH ENTRANCE
Notice pipe under old highway #10



Looking South from SOUTH ENTRANCE
Upward sloping hills

Case Study #55

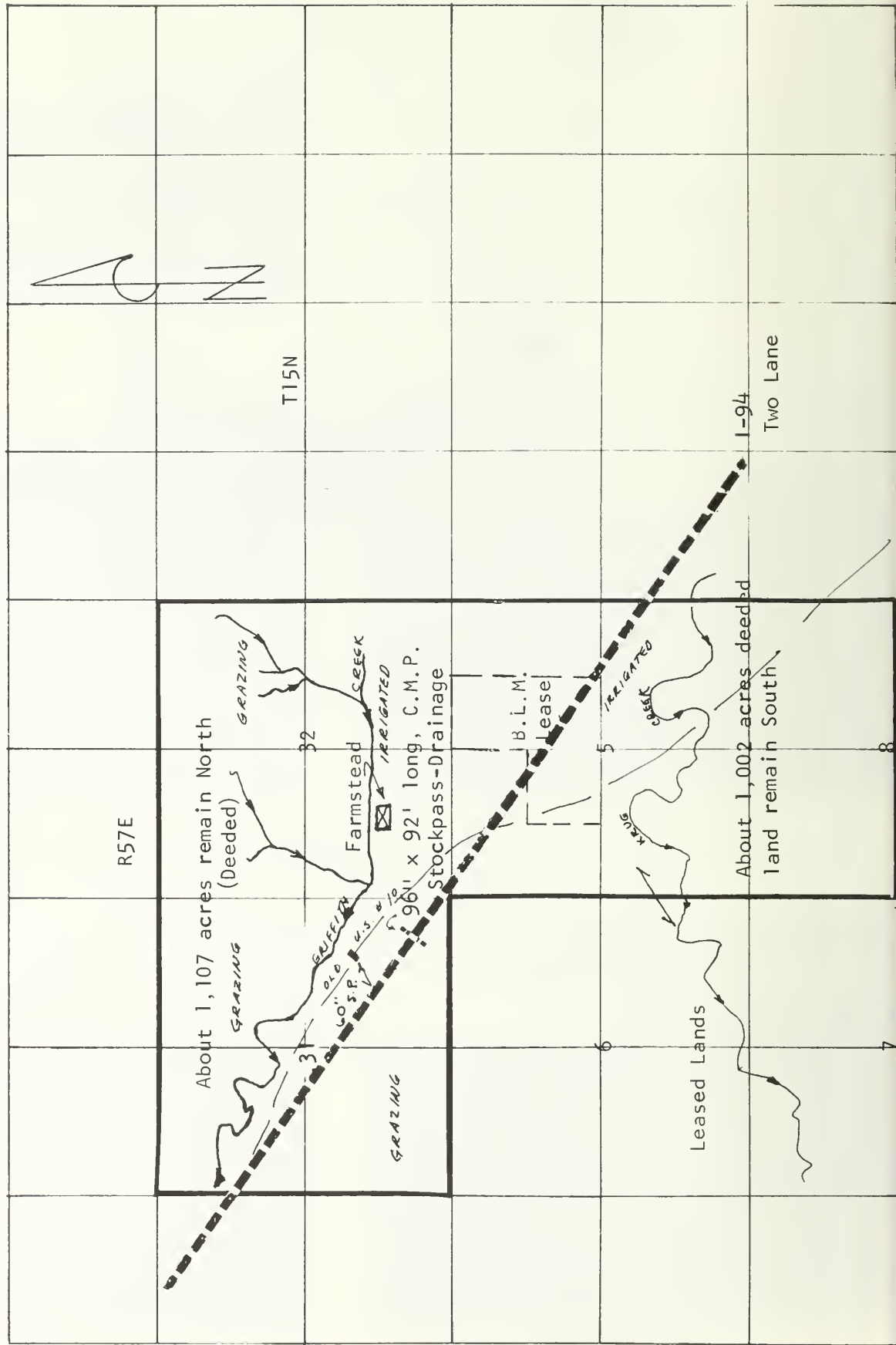


North Entrance; photo taken January, 1971.
Livestock have been taking shelter during
snowstorms.

OWNERSHIP PLAT

SCALE $1'' = \frac{1}{2}$ mile Principal Severance Situation Separation of grazing pastures

DATE 9/70 CASE STUDY NO. 55 STRUCTURE AGE 6 yrs. PROJECT NO. I 94-6 (6)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 56 - Controlled Access
With A Permissive Right

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of croplands and pastures; about 1,108 acres remain north and 480 acres remain south.

TYPE OF OPERATION: Cow-calf -- number of cattle unknown.

LOCATION: About four miles west of Wibaux, located in Section 4, Township 14 North, Range 59 East, and Section 33, Township 15 North, Range 59 East, M.P.M., Wibaux County, Station 188+50 on Project 1 94-7 (2)

STRUCTURE TYPE: 72" diameter x 108' long, C.M.P., Drainage structure with about 6' of cover. Actual measurement is the same. This is also used for stock by Morgan, a neighbor.

SPECIFIC PROBLEMS: This was never intended to be used for stock; however, it is not located in a gully, and therefore is wingfenced for possible use. The lessee did try to utilize the pipe for stock movement but has not had any success. He has had to change some fencing which has been rather minor, at a cost of about \$100.00. Originally, a stock lane was fenced into this stockpass with no possible usage after it was found out cattle would not use this underpass. A neighbor does make use of it, however.

ADEQUACY: The lessee naturally feels the pipe should be larger, although the location is suitable. It would be an adequate drainage structure but an inadequate stockpass for the lessee. Morgan, a neighbor, however, uses the pipe all the time during fall and winter for 75 head of cattle. The pattern is grazing on the south side and water on the north side. He does say he puts material in the bottom of the pipe before the stock will use the structure.

REMARKS: Here is a rather typical example of an undersized stockpass utilized by one rancher and not used at all, or incapable of being used, by the other. Management is the important factor here, if the cattle breed is similar. A larger stockpass located on the Morgan place, however, was not conclusively adequate, yet here he does use this structure with more success than the 9' x 212' stockpass on his own ranch unit. The 9' x 212' pipe would have a higher utility rating than the 6' x 108' structure, if we consider utility as a sole function of size and length. Management, drainage and topography appear to be the other variables to be considered in making a comparison.

I 94-7 (2)
WIBAUX EAST

72' x 108' long, C. M. P.
Drainage Only



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

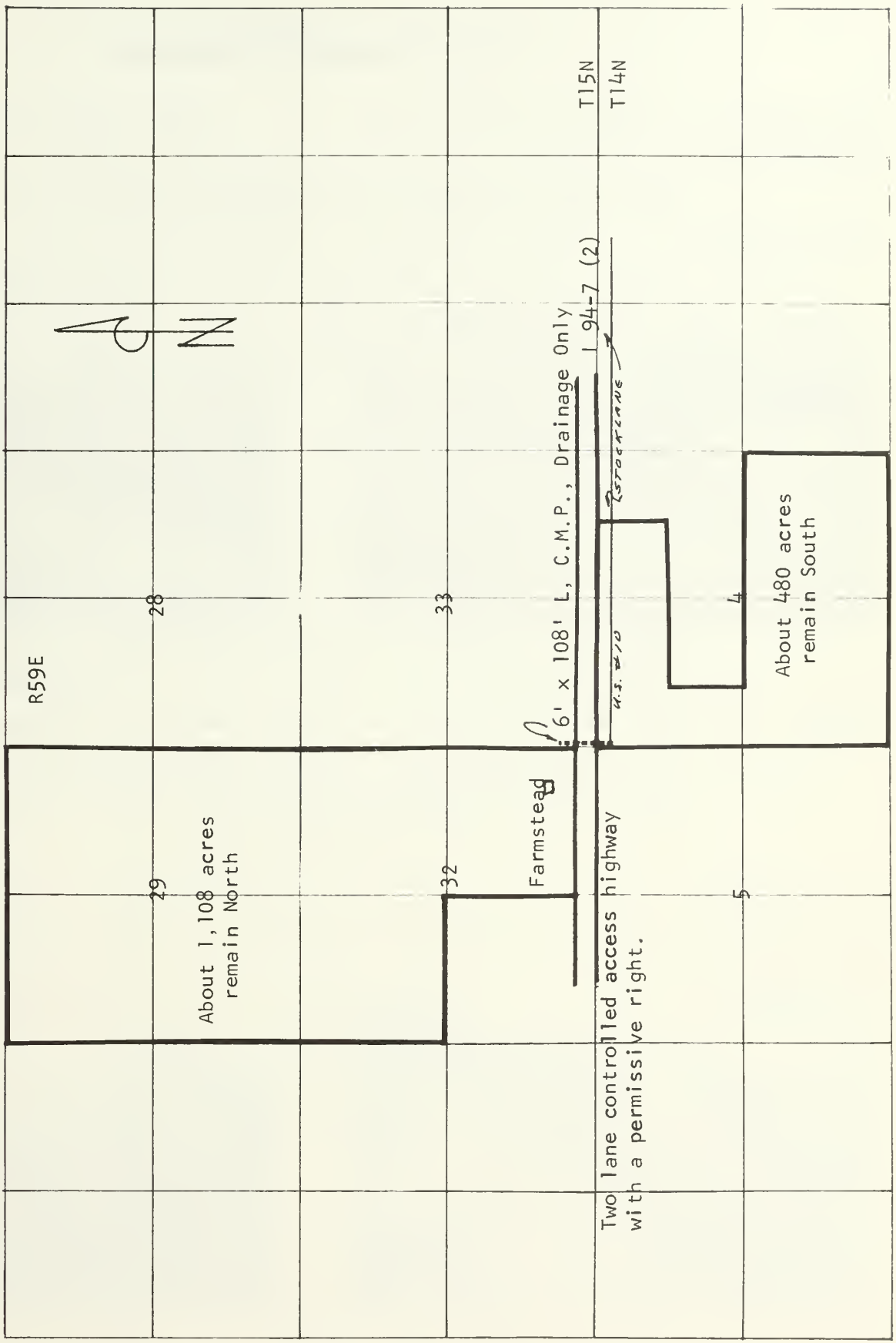


Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1/4 mile Principal Severance Situation Separation of croplands & pastures

DATE 9/70 CASE STUDY NO. 56 STRUCTURE AGE 7 yrs. PROJECT NO. I 94-7 (2)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 57 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures and cropland; about 980 acres remain north and 180 acres and headquarters remain south.

TYPE OF OPERATION: Cow-calf -- runs about 100 head of cows and feeds the calves through the winter. Two saddle horses use the pipe freely.

LOCATION: About 15 miles northwest of Sidney, located in Section 3, Township 24 North, Range 57 East, and also Section 32, Township 25 North, Range 57 East, M.P.M., Richland County, Station 414+75 on Project S 361 (9).

STRUCTURE TYPE: 84" diameter x 85' long, C.M.P., stockpass with about 4' of cover. Actual measurement is the same.

SPECIFIC PROBLEMS: Primarily a snow problem. Pipe blows in completely so at times it is unusable. The user apparently has enough flexibility that this is not a major problem; however, he would like it large enough to drive a pickup through. The present location is the only feasible location.

ADEQUACY: The owners are satisfied with the pipe, although they did mention they would like to be able to drive a pickup through. It has a good rating by the investigator also. The structure has been in use about nine years.

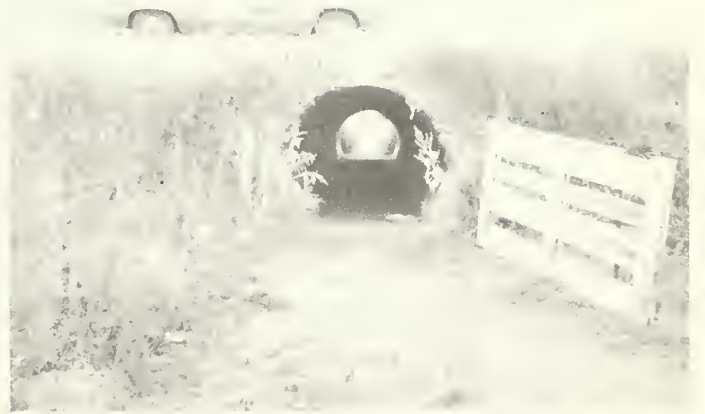
REMARKS: It appears this is a successful stockpass because of management, length, location, topography, and lack of drainage. The same structure does not work in other situations. A large stock reservoir north of the farmstead holds back drainage water and prevents the south to north drainage which would make this a boggy underpass.

S 361 (9)
SIDNEY-NORTH and WEST

84' x 85' L, C.M.P.
Combination Stockpass-Drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

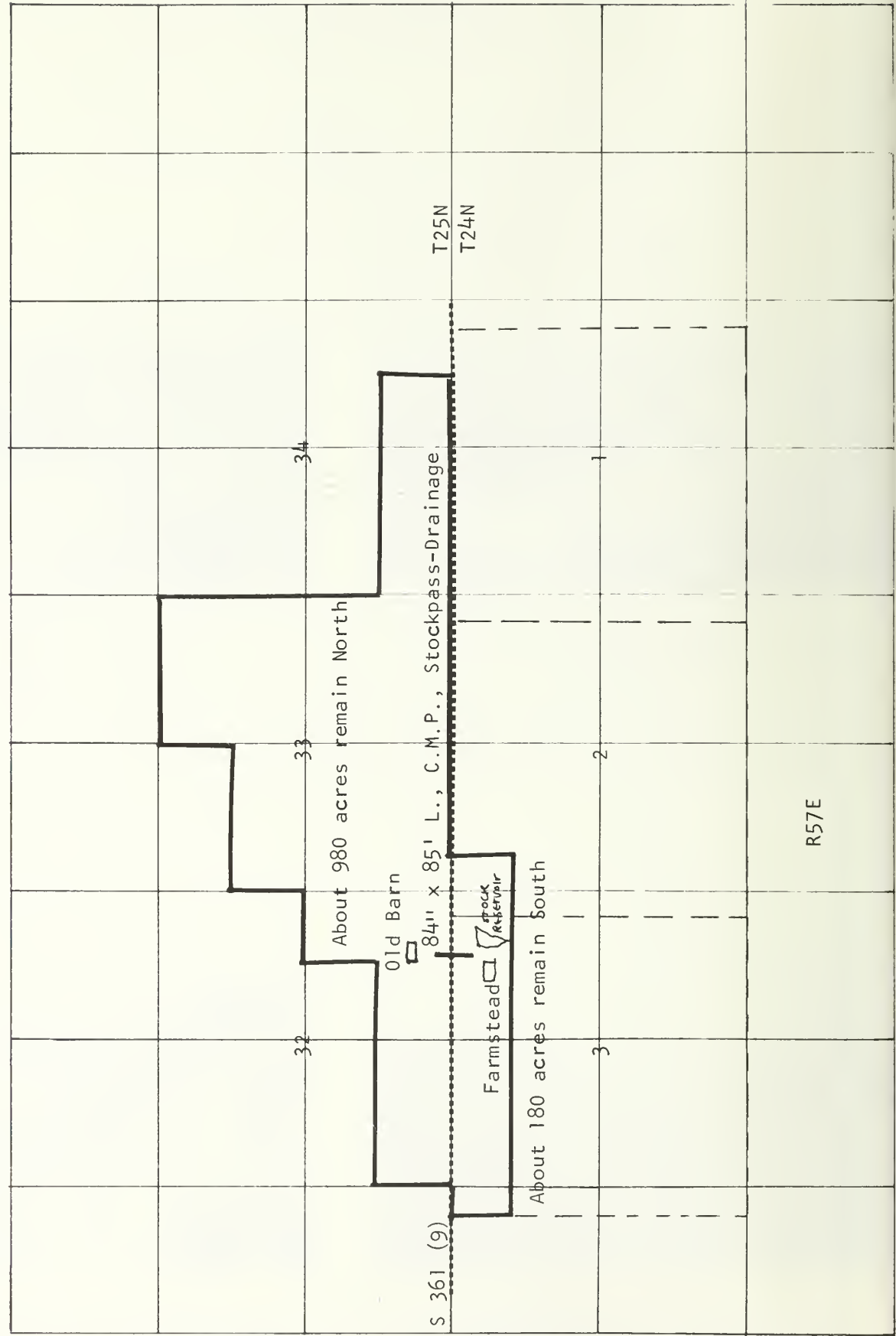


Looking South from SOUTH ENTRANCE
Notice Headquarters Buildings

OWNERSHIP PLAT

SCALE $1'' = \frac{1}{2}$ mile Principal Severance Situation Separated pastures and cropland

DATE 9/70 CASE STUDY NO. 57 STRUCTURE AGE 9 yrs+ PROJECT NO. S 361 (9)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 58 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of croplands; about 240 acres remain north and 210 acres remain south.

TYPE OF OPERATION: Unknown, because owner and lessee were not available. Primarily, a dry land farm operation.

LOCATION: About 8 miles east of Culbertson, located in Section 34, Township 28 North, Range 57 East, M.P.M., Roosevelt County, Station 1406+50 on Project F 84 (27).

STRUCTURE TYPE: 16'7" span x 10'11" rise x 150' long, C.M.P., drainage only, with about 4' of cover. Actual measurements are the same.

SPECIFIC PROBLEMS: Very little slope on the drain pipe; however, it drains a large enough area to be sufficiently clean. There is no pavement on the pipe bottom and it is in the bottom of a deep channel change which has carried a lot of runoff at various times. The south outlet has eroded around the pipe edges and the north inlet is littered with big rocks.

ADEQUACY: Although the structure has been in use for drainage for 13 years, because of the deep channel change both north and south, and the lack of fencing combined with the washing and erosion problems, it is very obvious that this pipe cannot be used for a stockpass or a machinery pass.

REMARKS: This could be made usable for a stock structure by an expenditure for stabilization materials at the inlet and outlet, pavement in the pipe, and proper wing fencing. This would be quite an expense to the landowner, however.

F 84 (27)
CULBERTSON-BAINVILLE

16'7" span x 10'1" rise x 150' L, C.M.P.
Drainage Only



NORTH ENTRANCE



SOUTH ENTRANCE: Notice outlet erosion,
boulders washed in other end



Looking North from top of NORTH ENTRANCE
Notice deep channel

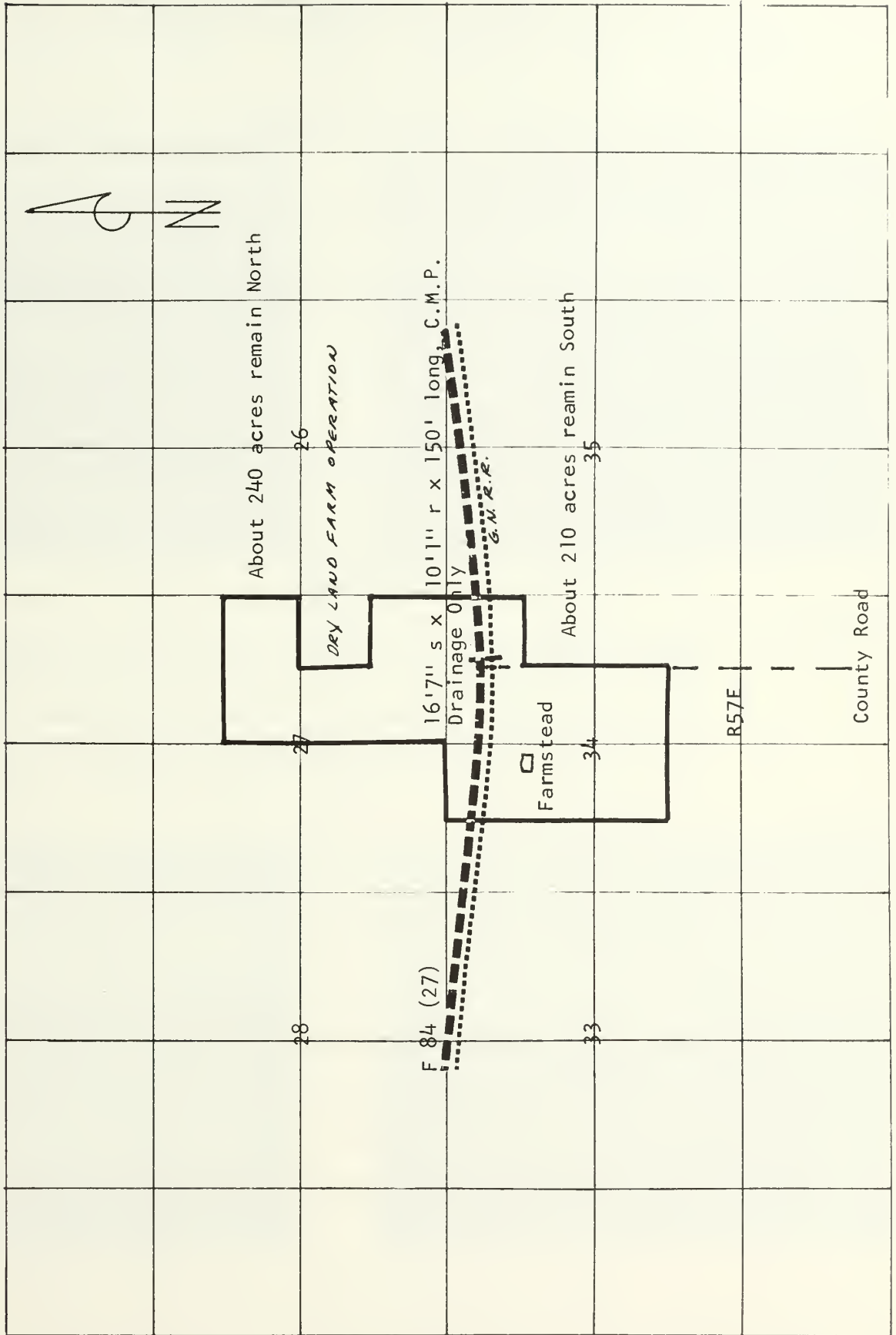


Looking South from top of SOUTH ENTRANCE
Notice erosion

OWNERSHIP PLAT

SCALE 1"=1/4 mile Principal Severance Situation Separation of croplands

DATE 9/70 CASE STUDY NO. 58 STRUCTURE AGE 13 yrs. PROJECT NO. F 84 (27)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 59 - Controlled Access
With A Permissive Right

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of pastures and croplands; about 3,810 acres remain north of right-of-way and 630 acres remain south of right-of-way.

TYPE OF OPERATION: Community usage; all six parties involved run cows and also farm some dry land crops. No one runs sheep through this structure.

LOCATION: About 4 miles west of Wibaux, located in Section 4, Township 14 North, Range 59 East, and Section 33, Township 15 North, Range 59 East, M.P.M., Wibaux County, Station 205+00 on Project 1 94-7 (2).

STRUCTURE TYPE: 13'10" span x 11'9 $\frac{1}{2}$ " rise x 108' long, C.M.P., vehicular underpass with about 5' of cover. Actual measurements are the same.

SPECIFIC PROBLEMS: This pipe blows in very badly during snowstorms. One user, in particular, is affected during this time. On occasion, he has had to drive cattle across the interstate. Most of the users feel this pipe should be larger, at least large enough to pass a loaded hay truck. One of the users has a bad time getting his young calves to go through because of the black-topped bottom of the structure. Ice in the springtime also creates a bad problem.

ADEQUACY: There are about a half dozen users of the underpass. The south end opens at the Tachida place, and the north end opens onto the Niece place. Because of stocklanes on both sides of the interstate, most of the users have ready access; however, most would like it larger. They consider the location as good as any because of the stocklanes. One individual in particular was quite pleased with the underpass. The underpass would have to be considered less than adequate for this many users.

REMARKS: This two-lane interstate section will eventually be widened to four lanes. This structure's utility will decrease primarily because of complete access control, as well with the lengthening of the pipe. The stock lanes may provide access to an interchange area and alleviate the stock and vehicle movement situation.

11'9 $\frac{1}{2}$ " rise x 13'10" span x 108'L, C.M.P.
Vehicular Underpass-Stockpass



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE
(From top of pipe)



Looking South from SOUTH ENTRANCE
(From top of pipe)

Case Study No. 59

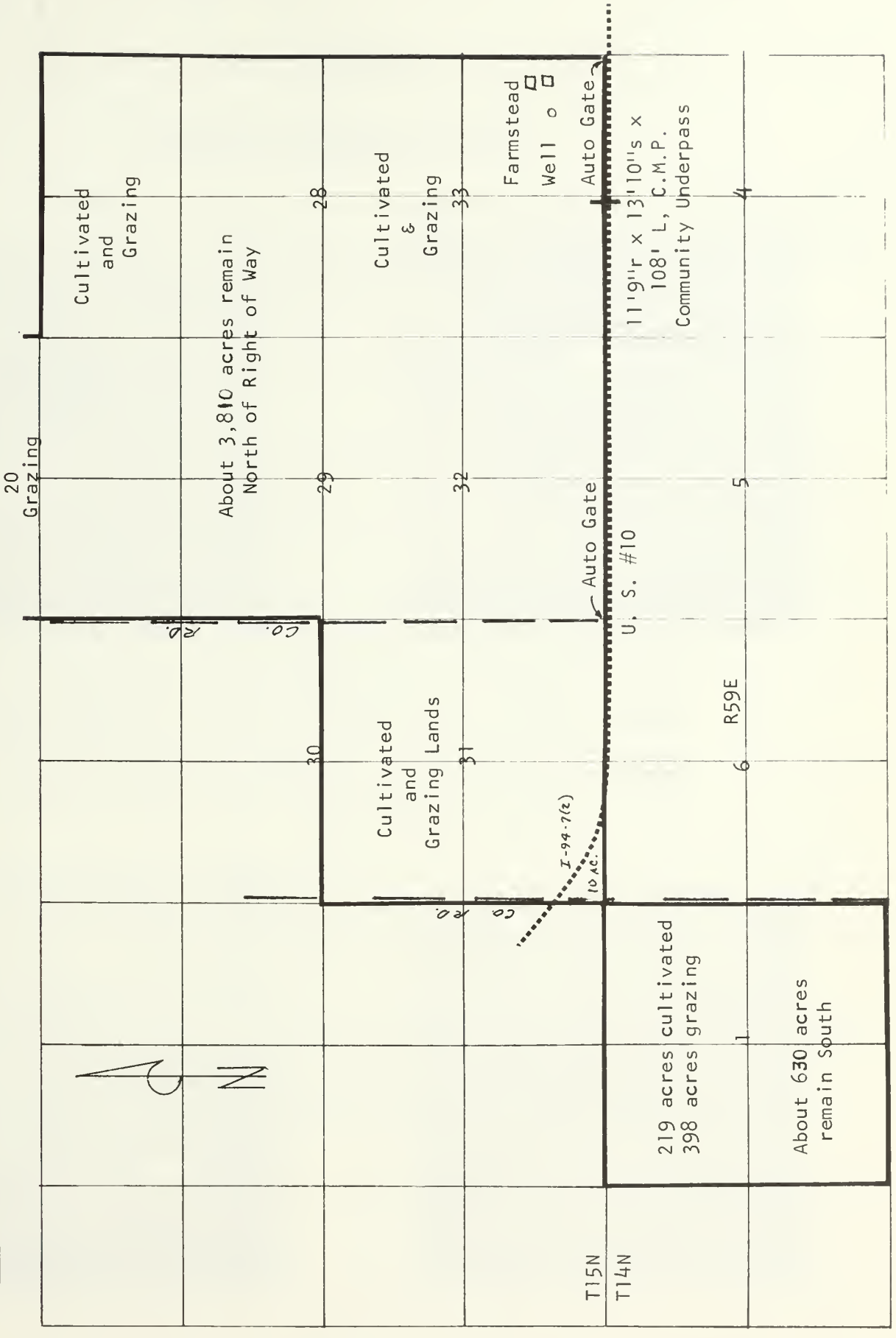


South Entrance of Community Stockpass; photo taken during January, 1971. Wind had blown only one day, rendering this impassable.

OWNERSHIP PLAT

SCALE 1" = 1/2 mile Principal Severance Situation Separation of pastures & croplands

DATE 9/70 CASE STUDY NO. 59 STRUCTURE AGE 7 years PROJECT NO. I 94-7 (2)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 81 - Non-Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separated summer and fall pastures, as well as after-math grazing. About 160 acres of leased land and 1,197 acres of deeded land remain north and 1,214 acres of deeded land and 1,440 acres of leased land remain south of right-of-way.

TYPE OF OPERATION: Cow-calf -- about 150 to 200 head of cows; keeps good heifer calves for replacement stock.

LOCATION: 14.5 miles west of Plevna, located in Section 27, Township 8 North, Range 54 East, M.P.M., Custer County, Station 39+35 of Project F 86 (23).

STRUCTURE TYPE: 5'10" span x 7'7" rise x 96' long; type "B" stockpass-drainage. Actual measurement was 5'5" span x 7'3" rise, with about 3' of fill.

SPECIFIC PROBLEMS: The structure presently is not in use; however, it appears to be in very good condition and would meet the needs of the owner. He states he cannot, however, get cattle through the structure. The landowner also stated that when he found he couldn't get his cattle through the pipe, he fenced it off and broke up some of the land to the south of the highway. Also, his spring has quit flowing. The pipe installed to drain it from under the roadway no longer carries water from the once-flowing spring. He then drilled a well north of the highway. He now pastures the north side in the summer and fall and the south side in the fall, winter and spring, until he has the cows calved out and moves them across the highway.

ADEQUACY: The landowner feels it is too small and should be deeper in the draw with more cover over the top so that the cattle cannot see over. The thought that had the structure been moved 40 feet more westerly and placed lower in the fill, it might have been more usable. The landowner does not consider it adequate, but the investigator feels it has utility as a stockpass. It would have to be considered "conditionally adequate".

REMARKS: The above judgement was reached due to the nature of the situation. The owner was very disturbed and bitter toward the State Highway Commission over loss of his spring and the location of the stockpass. There could be gravel spread on the approaches and along the north end where it is washing, and it appears the structure would be adequately serviceable.

F 86 (23)
MILES CITY-PLEVNA

5'10" span x 7'7" rise x 96' L., C.M.P.
Type "B" stockpass-drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

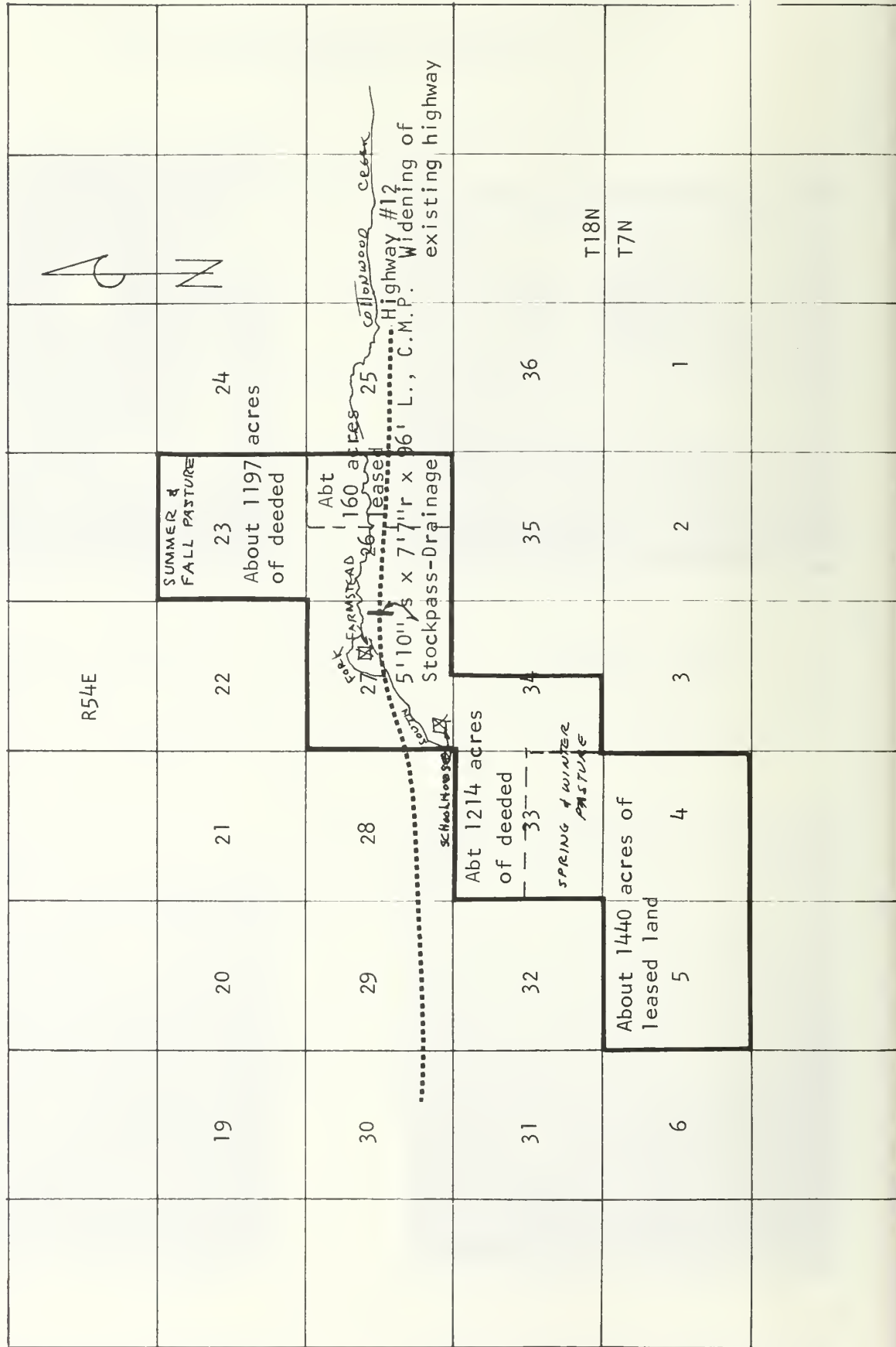


Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Separated summer and fall pastures, as well as aftermath grazing.

DATE 10/70 CASE STUDY NO. 81 STRUCTURE AGE 5 yrs. PROJECT NO. F 86 (23)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 82 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of winter and summer pastures.

TYPE OF OPERATION: Cow-calf -- approximately 400 head of cows plus replacement cattle. If enough feed warrants additional stocking, he leases or buys cattle to feed on extra summer pasture.

LOCATION: About 2.5 miles east of Locate, Montana, located in Section 22, Township 8 North, Range 57 East, M.P.M., Custer County, Station 510 on Project F 86 (21).

STRUCTURE TYPE: 6'11" span x 8'6" rise x 120' long, C.M.P., stockpass-drainage with about 4' of fill. Actual measurement is 6'6" span x 7'6" rise (south) and 8'2" (north).

SPECIFIC PROBLEMS: The lessee stated the structure ices up badly in the wintertime and he has to sand and gravel the approaches and the bottom. He also feels the structure is too narrow and should be one cow wider, or at least 9 to 10 feet wide. The lessee stated that a better method of draining the water from the roadway ditch and side hill could have been achieved. It appears most of this runoff is stopped from draining to the drain pipe and has to filter through the stockpass. The stockpass is set too high on the "out" end and causes an 8" buildup of silt in the south end of the structure while the north end is clean. He has a severe snow problem as the structure fills with snow at the south end. He has to use this pipe in winter for watering his stock on the north side of the highway. He has not been able to develop a well south of the highway. His main problem is the snow melting and running into the pipe to the north side and forming ice which requires sanding and graveling of approaches.

ADEQUACY: The lessee feels this structure is too small for the number of cattle he is required to move to and fro through the structure. He felt one cow wider, or at least 9 to 10 feet of width, would be more serviceable. This structure could have been located $\frac{1}{4}$ mile east of the present site with a flatter access to and from the structure ends. This structure is barely adequate for the number of cattle required to move through in the wintertime, which severely handicaps stock to water movement during periods of heavy snowfall.

REMARKS: Of the five structures on this property, he stated the two 15' drain pipes in Locate Creek and a 10' west of these, are the most serviceable. However, they are drains and are sometimes full of ice or running water. During the dry season, they afford him fair access to both sides of the highway for cattle movement. The 72" and 84" drains are of no use at all. He wishes he had larger structures and one more larger stockpass on this property. He feels he then would have a good working operation with limited management problems.

F 86 (21)
LOCATE-PLEVNA

6'11" span x 8'6" rise x 120' L, C.M.P.
Stockpass-Drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

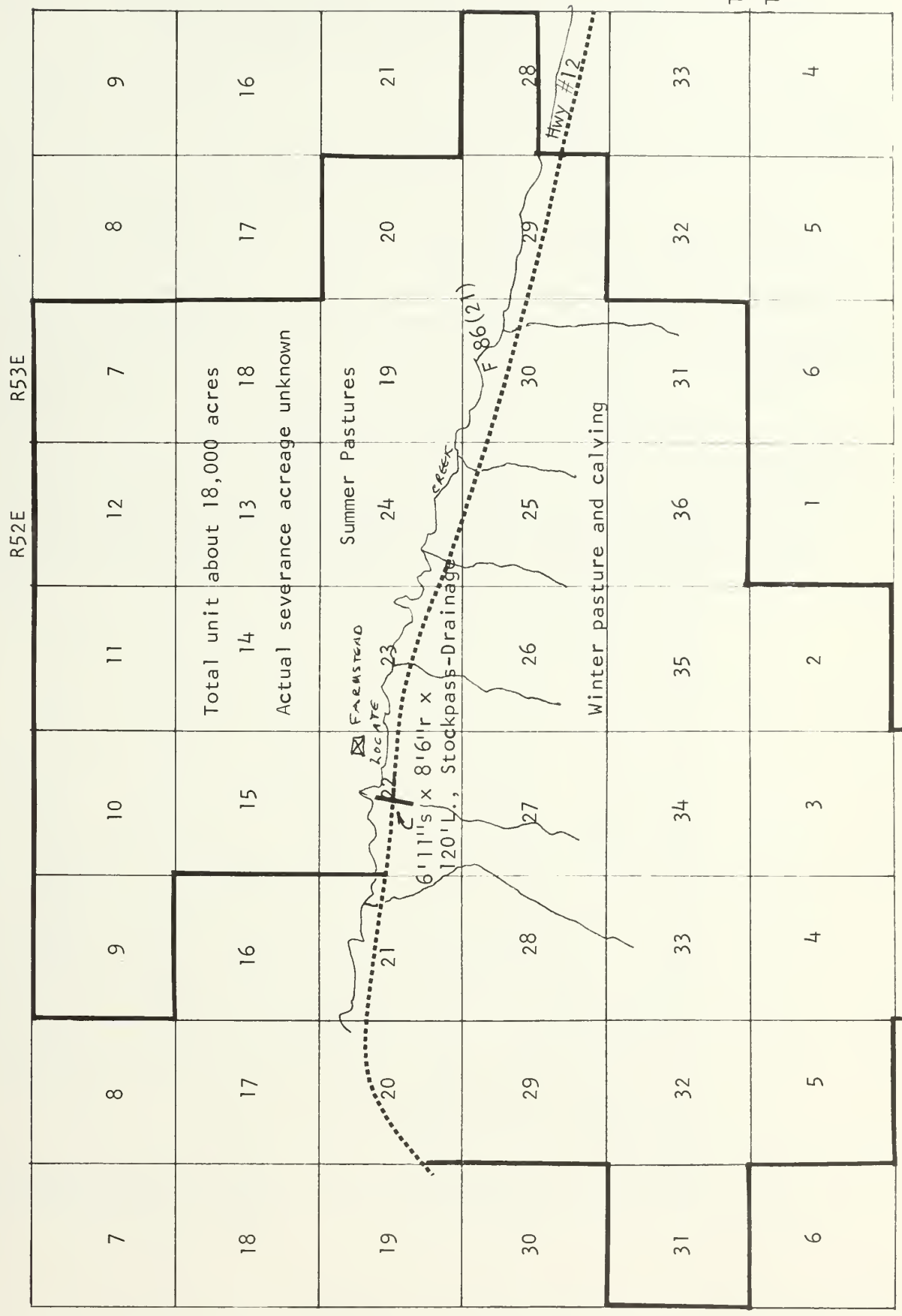


Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Separation of winter and summer pastures

DATE 9/70 CASE STUDY NO. 82 STRUCTURE AGE 5 yrs PROJECT NO. F 86(21)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 83 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of grazing and dry cropland from irrigated land and water. About 94 acres remain south and 362 acres remain north.

TYPE OF OPERATION: Cow-calf -- about 20 head of cows on subject property where underpass is located.

LOCATION: Eight miles west of Forsyth, located in Section 28, Township 6 North, Range 39 East, M.P.M., Rosebud County, Station 1787+10 on Project 194-3 (10).

STRUCTURE TYPE: 180" diameter x 176' long, C.M.P., stock and vehicle usage, as well as emergency overflow drain from double 48" x 206' drain pipes. Actual measurement is 14'3"; usable width 12' and 12.5' of usable height. It is considered a community underpass of sorts.

SPECIFIC PROBLEMS: The structure, though well used, is a problem child to the landowner and the State Highway Commission maintenance people. It is a community underpass built on about a 43° skew right. This structure is good for cattle movement, trucks, pickups, cars, tractors, and track tractors; however, it will not accommodate any other type of machinery. Two users haul grain through the structure and drive three miles east or west for larger equipment crossing. This they indicated to be a very negative factor in the utility of this structure. Both of these users stated that this structure has washed badly during heavy runoffs in the spring and flash cloudbursts. They mentioned the Highway Commission had to repair the ends several times. It also blows full of snow in the winter. They did, however, agree with the landowner that the structure is adequate for their limited use, and during the summer is the only time they have need of the structure. Another user runs approximately 275 head of cows and has over 6,000+ acres south of the highway, with the balance of his operation headquarters, hayland, irrigation, etc., lying northerly of the highway. They winter their cattle and calve them out south of the highway and use the structure probably twice as much as all their neighbors put together. Their operation requires them to use this pipe throughout the year, and especially heavy during the winter and spring and inclement weather. These people are very concerned over the snow problem and spring runoffs. They have called the State maintenance force to open the pipe many times and to repair it when the runoff washes out the road. Two years ago in the spring, during calving season, they were unable to get across to their cows for five days, and they cut the interstate fence in order to get across.

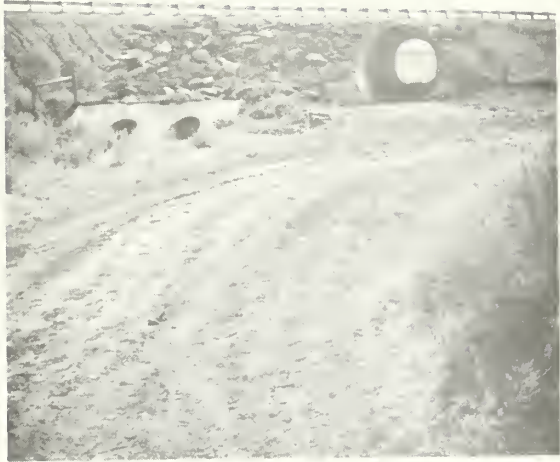
ADEQUACY: Three of the users, including the landowner, agree it is adequate for their limited usage. The main user finds it very inadequate.

REMARKS: The users feel a bridge over Wayant Coulee was the only answer to the problem. Everyone feels this would have afforded a better all around use of the structure, especially in the future when the other two lanes are added. The investigator remarked that even the State Highway Engineers are concerned with what can be done in this area when the next two lanes are added. It is, seemingly, the opinion of all that the next two lanes are only going to enhance the problems of runoff water washing out the ends of the structure at the approaches and greater snow problems.

This problem was discussed with the Maintenance Division: the work to maintain and repair the structure approaches. It was stated that they had to repair the ends of the pipe and roadway at least six times and haul in more riprap rock to help hold down the washing problem. Further, they stated that every time the pipe is snowed in, they are called collect to come and open the road through the pipe. They have used a front-end loader and also cut down a grader so as to perform the work of opening up the structure when it is blocked with snow. The cost is about \$500 per year.

This structure, with its poor drainage, snow problems, and size, all tend to lend a pattern of problems to all parties, whether it be a landowner or the State Highway Commission. Snow fences, cutting the coulee deeper on the inlet side, may alleviate some of the problem; however, I am sure the maintenance people have looked at every angle and possibly this structure will still remain of such poor utility as to consider a completely new bridge structure for the extension of future two lanes.

180' x 176', C.M.P.,
Stockpass-vehicular-drainage



NORTH ENTRANCE; Notice drainage pipes



SOUTH ENTRANCE; Notice drainage pipes



Looking North from NORTH ENTRANCE

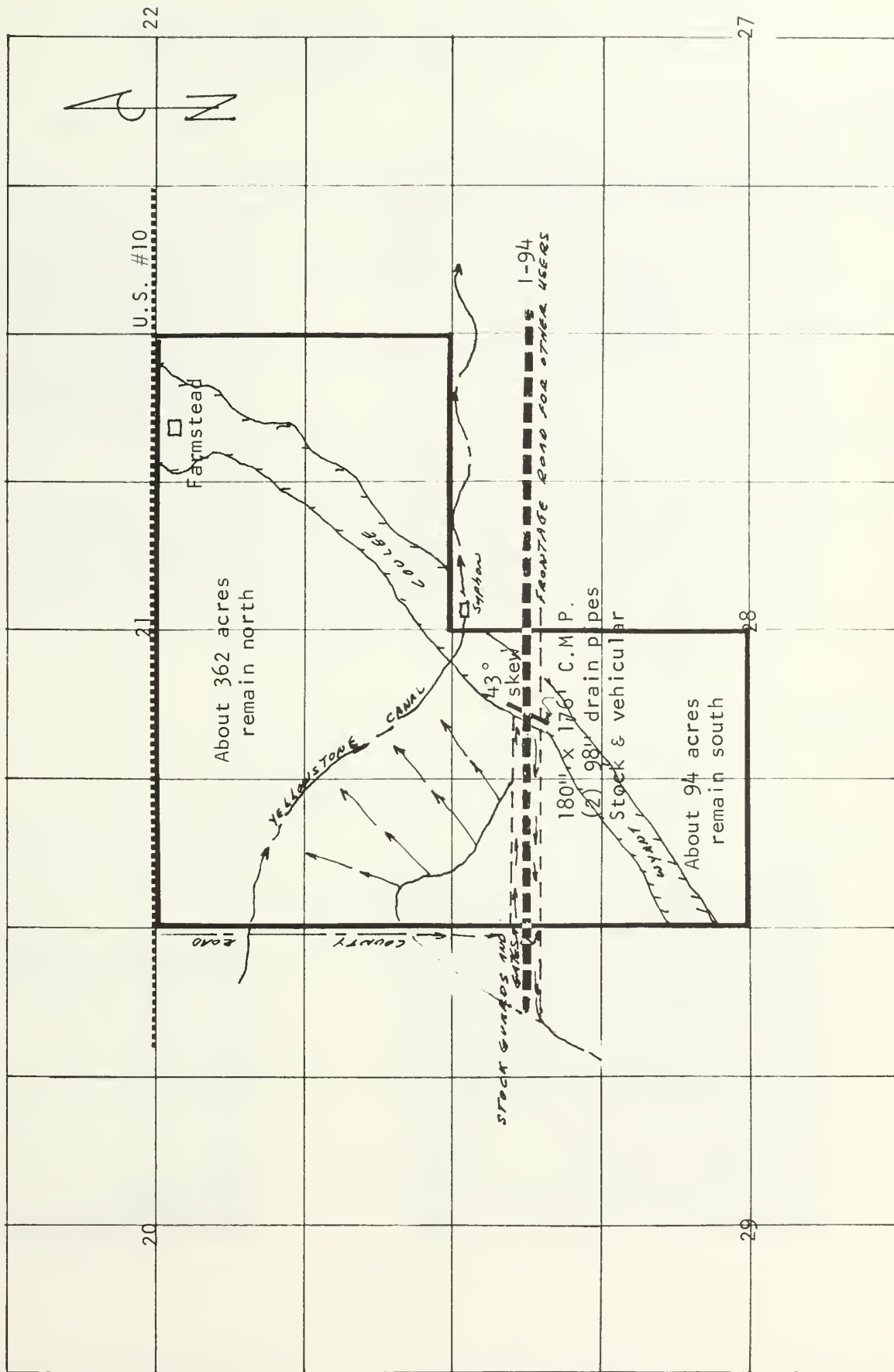


Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Separation of grazing & dry cropland from irrigated land

DATE 10/70 CASE STUDY NO. #83 STRUCTURE AGE 4 yrs PROJECT NO. I 94-3(10)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 84 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of summer and winter pastures; about 602 acres remain north and 3,400 acres remain south.

TYPE OF OPERATION: Cow-calf -- about 230 head of cows and yearlings. Former owner ran about 150 head of stock cows.

LOCATION: About 1.3 miles east of Hathaway, located in Section 12, Township 6 North, Range 44 East, M.P.M., Rosebud and Custer Counties. Station 306+50 on Project 1 94-3 (2).

STRUCTURE TYPE: 15'6" span x 13'10" rise x 130' long, C.M.P., stockpass-vehicle drainage. Actual measurement is 15'3" span x 13'4" rise.

SPECIFIC PROBLEMS: The south approach is washing, with approximately 3' cuts. Ice is a big problem. This man winters cows south of the highway and headquarters, due to natural heavy cover. He has the most trouble with melting snow and ice from January until about April or May. He uses hay and some gravel to keep the structure passable for stock when he has to move them back and forth. The landowner thought a small drain-pipe to one side of the structure would carry away the minor thawing runoff.

ADEQUACY: The landowner said it was as good as could be expected, and better for moving stock than he had at first anticipated. It was considered the only location desirable which was also convenient to his buildings. This structure was considered adequate by the landowner.

REMARKS: This structure appears to have an unusually high utility considering the drainage problem south to north to the Yellowstone River. The vegetation shows this to be a fairly low annual rainfall area, but it is not unusual for flash runoffs to heavily erode a drainage bottom. A smaller drain pipe alongside might have been feasible in this situation.

I 94-3 (2)
HATHAWAY-EAST

15'6" span x 13'10" rise x 130' L, C.M.P
Stockpass-Vehicle-Drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE
Notice old Highway #10 roadbed

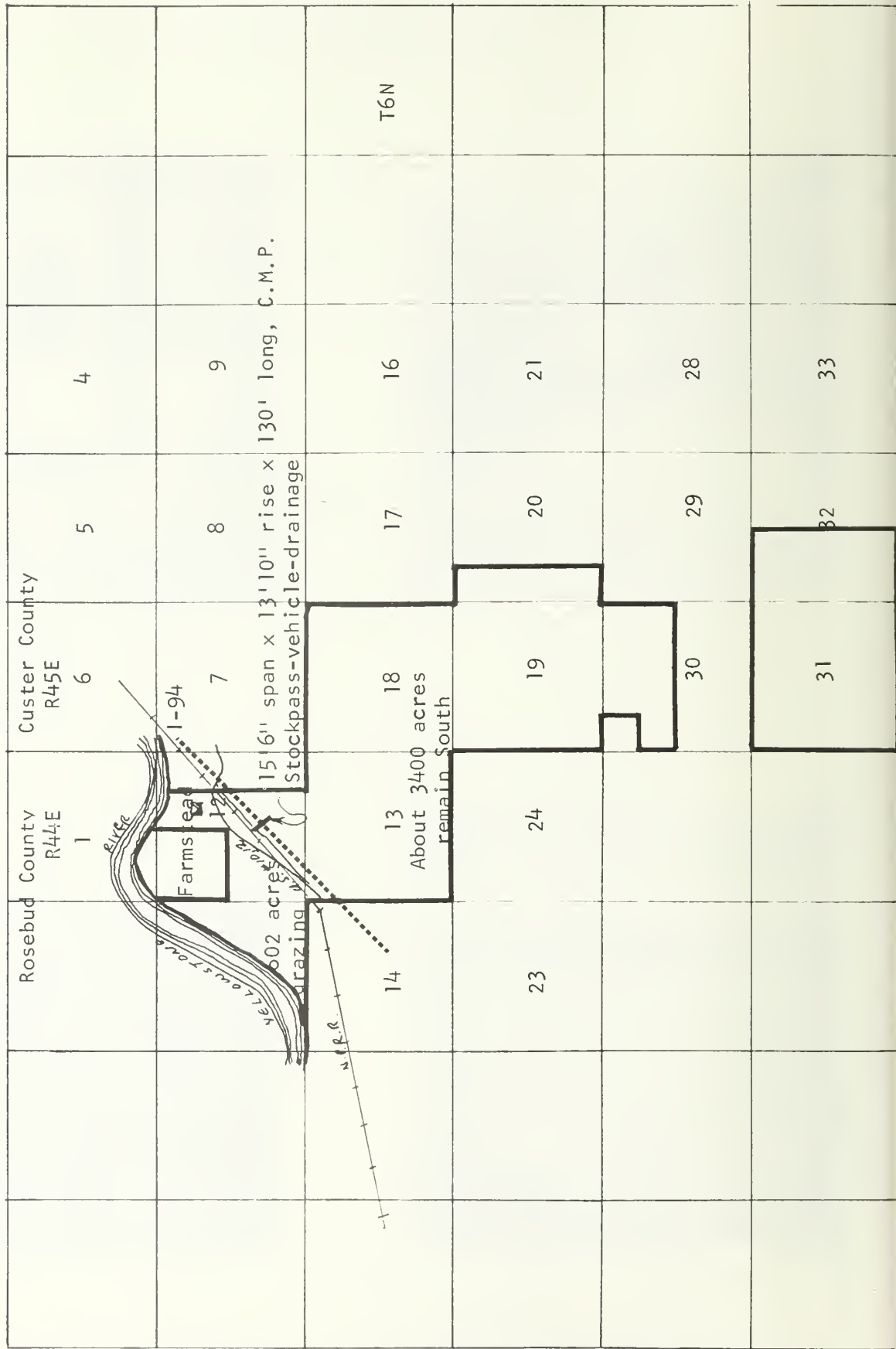


Looking South from SOUTH ENTRANCE
Notice drainage erosion

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Separation of summer and winter pastures

DATE 10/70 CASE STUDY NO. 84 STRUCTURE AGE 9 yrs PROJECT NO. 194-3 (2)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 85 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of summer and winter pastures; about 960 acres remain south and 1,301 acres remain north.

TYPE OF OPERATION: Cow-calf -- about 170 head of cows and keeps yearling heifers for replacement stock.

LOCATION: 7.5 miles southeast of Hysham, located in Section 22, Township 6 North, Range 37 East, M.P.M., Treasure County, Station 1216+00 on Project 1 94-2 (8).

STRUCTURE TYPE: 162" (13.5') diameter x 150' long C.M.P., stockpass-vehicle-drainage. Actual measurements are 13'1" span x 12'8" rise.

SPECIFIC PROBLEMS: This structure has been set in below-ground level and has flat-bottomed ditches or channels cut into and away from the pipe ends to drive on. This channel has no gravel on it and is quite muddy when wet. The structure has only a gravel bottom which washes out during heavy cloud-burst type rains - although drainage normally is light. Silt and mud does continue to wash in and had to be cleaned out. This structure was set up only for small tractors and trucks, or pickups. The main problem remains to be the gravel bottom and no gravel on approach ends in the channel. It fills in badly with snow during heavy snowfall and becomes impassable, then quite icy during thaws. The owner then goes around to Sarpy Creek underpass, or takes the overpass to the county road past Haines, across Cole to look for cattle.

ADEQUACY: It is considered adequate for his operation, even though it has several management problems. "Better than nothing" was the comment, and no other possible location. He was not overly happy with the situation; however, he did state he knew it was the best possible solution. He also felt that the bottom should have been oiled instead of rough-gravel bottom and the channel approaches have been graveled. More use by Hayes than Deveny.

REMARKS: This man complained mainly of the gravel in the bottom of the pipe and that the state had agreed to gravel the channel approaches and they did not. During inspection, a light rain made the problems quite evident. This structure was also set up to accommodate, by easement, Mr. Hayes, who has four sections south of the Deveny land south of 1-94. Mr. Hayes has 100 to 140 head of cows which run summer and winter south of the highway, depending on grass. There was no record of agreement by the State to gravel the channel approaches.

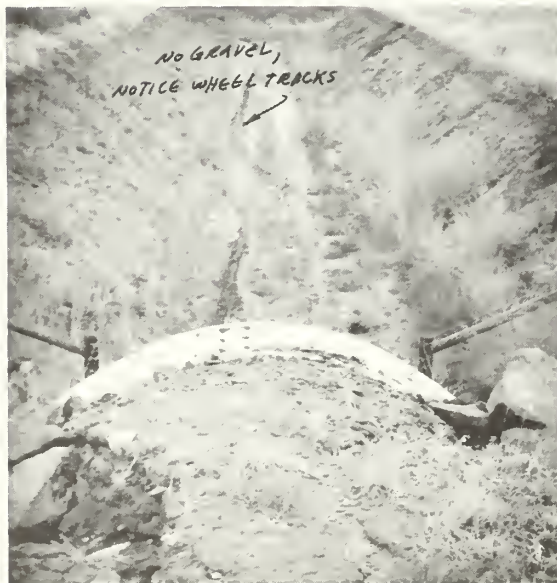
162" diameter x 150'+ long, C.M.P.



NORTH ENTRANCE



SOUTH ENTRANCE: Notice highway grade



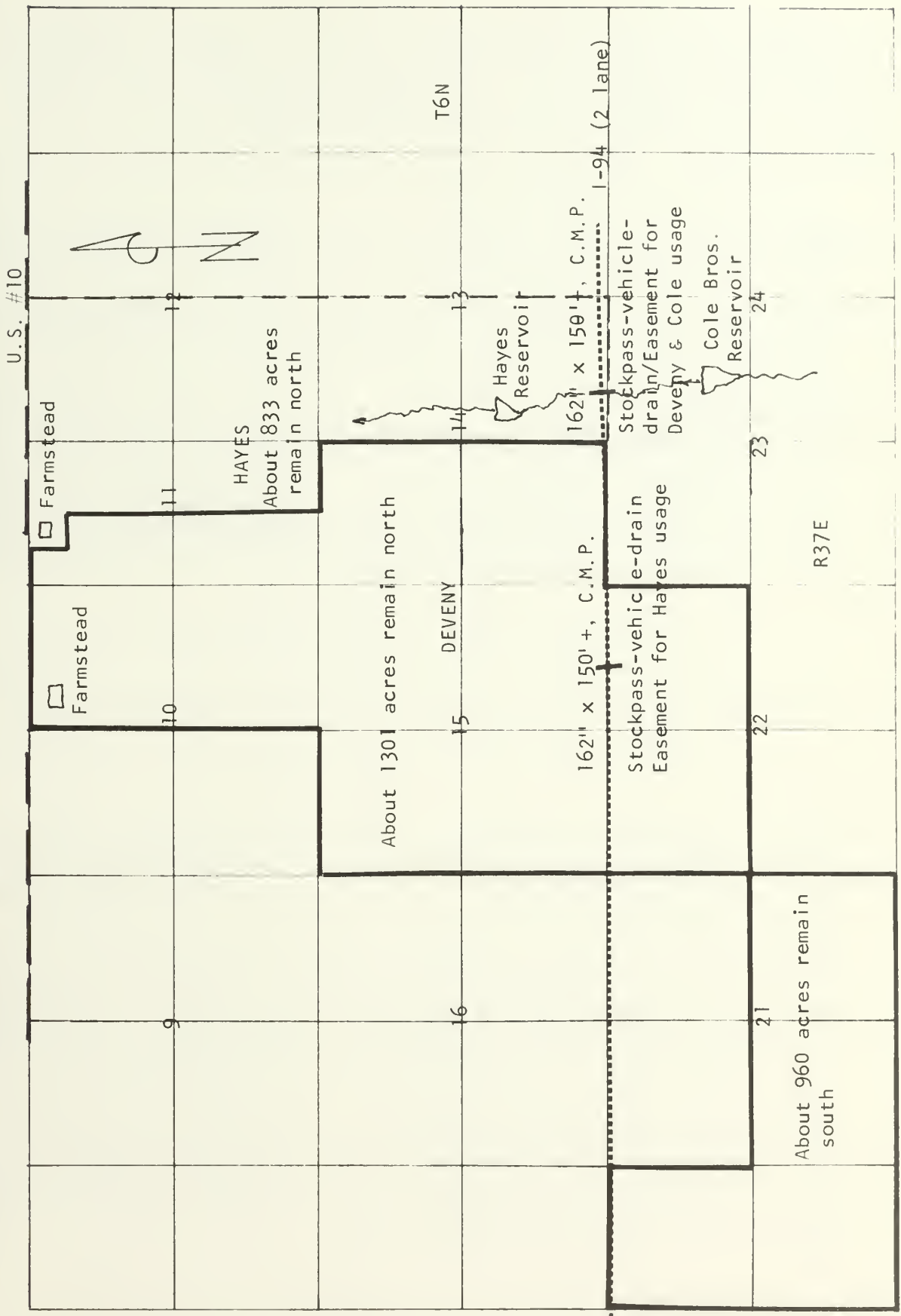
Looking North from NORTH ENTRANCE
Notice channeling to fit highway grade



Looking South from SOUTH ENTRANCE
Notice channeling and roadbed

OWNERSHIP PLAT

SCALE 1"=1/2 mile Principal Severance Situation Separation of summer and winter pastures
DATE 10/70 CASE STUDY NO. #85 STRUCTURE AGE 4 yrs PROJECT NO. 1 94-2 (8)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 86 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of summer and winter pastures. About 833 acres remain north and 3 remain south.

TYPE OF OPERATION: Cow-calf -- 100 to 140 head of cows and he keeps calves until they are yearlings.

LOCATION: About 8.5 miles southeast of Hysham, located in Section 14, Township 6 North, Range 37 East, M.P.M., Treasure County, Station 1264 on Project 1 94-2 (8)

STRUCTURE TYPE: 162" diameter (13.5') x 150'±, C.M.P., stockpass-vehicle-drainage with about 22' of cover. Actual dimensions are 12.8' span, 11.6' rise on the south and 12.1' rise on the north end.

SPECIFIC PROBLEMS: This structure has a rough gravel bottom with a slight continuous flow of water. It is always muddy and gravel washes out and has to be hauled back in. At the time of inspection there was approximately 4" of water and silt in bottom. It will accommodate only small tractors, pickups, and trucks with sides down. The structure had washed out a large hole on the north end, which the landowner repaired by hauling gravel back into the structure and filling the hole. The State compensated him \$60.00 for his work.

The underpass becomes filled with snow when the wind is from the north. He is afraid that when the next lane of traffic is built, he will have more trouble with snow than presently exists. He has cleaned it with a cat and a tractor during bad weather, and also goes around by county road past Laurence Haines to get his cattle. The structure fills with about one to two feet of ice during the winter due to the spring that flows water through the pipe, and subsequently creates an ice buildup.

ADEQUACY: The landowner considers this better than nothing and works fair for his operation. He thought it would have been better to place a drain beside the structure for the drainage and an asphalt bottom in the structure. It was considered to be the only location available. Holding pens were built on both ends of this structure for cattle movement.

The structure is used by the Cole Brothers and Deveney, by easement agreement between the three parties. Deveney uses this only slightly as he has the structure on his property and Sarpy Creek access. Cole Brothers run about 120 head of cows and calves south of the highway in the summer and sometimes in winter, depending on grass. They use the structure mainly for cattle movement and the county road past L. Haines for feeding and looking after their cattle. They built the south dam larger for more adequate stockwater, and are planning a second dam above the other one. When moving cattle, they have had trouble with the calves, due to the muddy condition of the structure, and have had to hold them in the holding pens for as much as four days before the cows can get them to follow through.

This structure would be considered "seasonally adequate".

REMARKS: All three parties using the structure stated there should be a small drain beside the structure and that the bottom should be asphalt, with good gravel ends or paved ends. Because the pipe is not usable during heavy snows, Sarpy Creek Access on the county road is utilized. At any rate, there do not appear to be any features curable other than those mentioned.

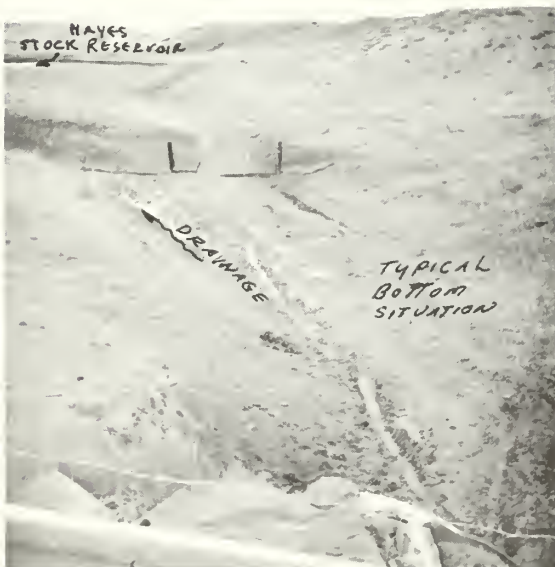
162" x 150'+, C.M.P.
Stockpass-vehicle-drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



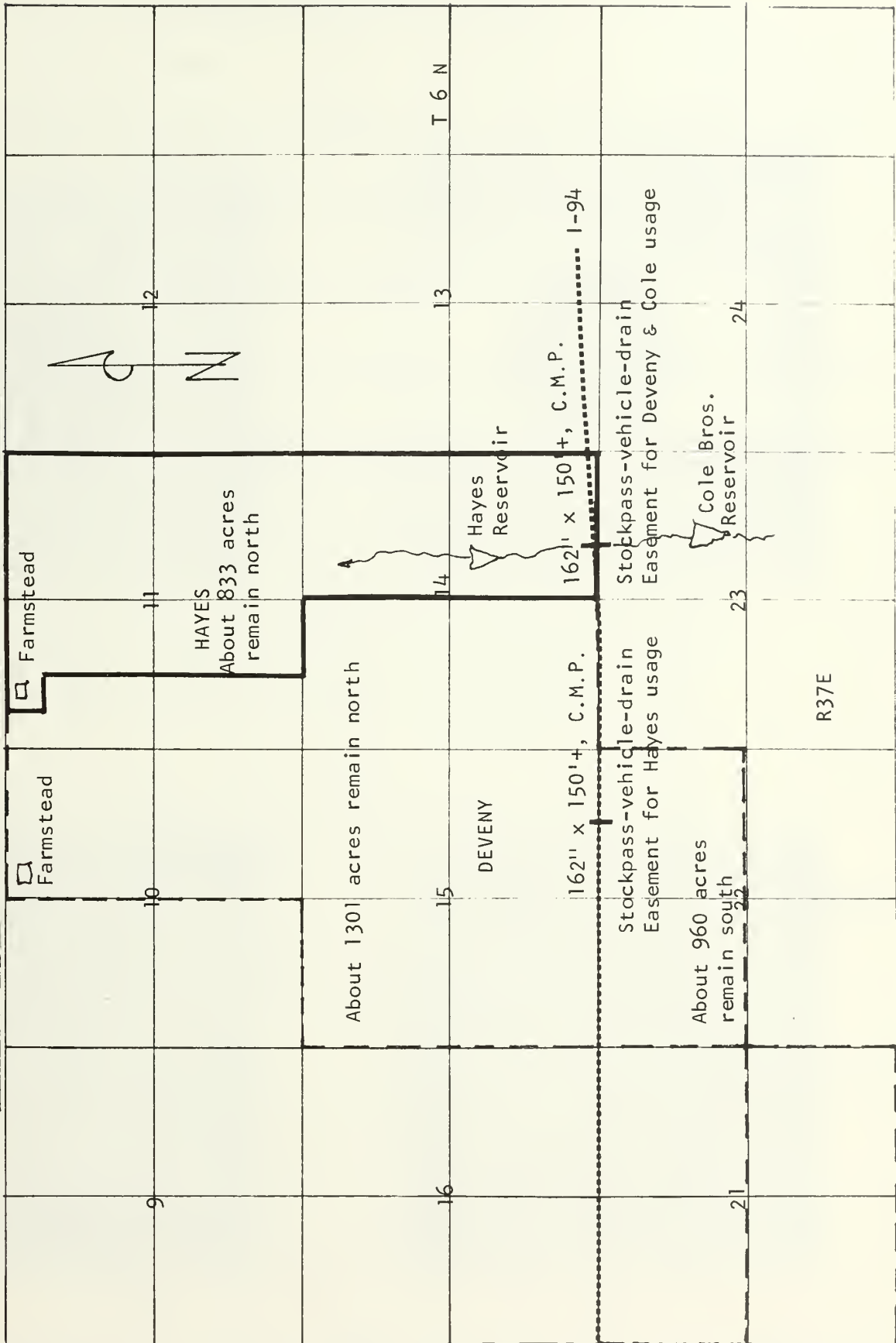
Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1/4 mile Principal Severance Situation Separation of summer and winter pastures

DATE 10/70 CASE STUDY NO. 86 STRUCTURE AGE 4 yrs. PROJECT NO. I 94-2 (8)

4.5 #10



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 87 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of winter and summer pastures. About 2,820 acres remain north and west and 700 acres remain south and east.

TYPE OF OPERATION: Cow-calf and yearlings; 1,000 head total. Most of the calves are held until yearlings before selling.

LOCATION: Approximately 10 miles southeast of Miles City, located in Section 7, Township 6 North, Range 45 East, M.P.M., Custer County, Station 360+90 on Project 1 94-4 (7).

STRUCTURE TYPE: 180" diameter x 326' long, C.M.P., stock-vehicular and drainage usage. Actual measurement was 14'3" span, 14' rise with about 54' of fill.

SPECIFIC PROBLEMS: This is considered a good stock structure; however, it involves management and maintenance problems. There is a small spring at the end of the pipe on the south side of the interstate and another one farther south up the creek that become nuisances during the fall and winter. Water flows into the pipe from the springs and freezes on the ends to a depth of 18" to 2' deep. During the winter and spring, the landowner has problems of breaking through the ice and becoming stuck. The bottom of the structure is wet almost year round. Also, on major runoff, there is a lot of gravel and large stones washed into the structure that has to be cleaned out in order to make it passable. The maintenance forces are faced with these problems of maintaining the structure for the landowner. Pictures were taken at a fairly favorable time of year.

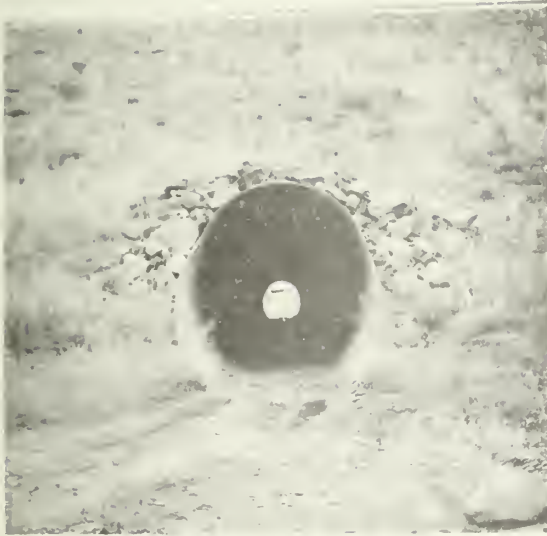
This "badland" type of country naturally produces large runoffs; however, this underpass is not the place for a combination drainage structure. The structure is fairly clear of snow problems. His original method of ranching was not noticeably changed as a result of construction of 1-94.

ADEQUACY: Although this structure has been in use eight to nine years, he thought that the structure was quite adequate for his needs, as long as the maintenance forces can keep it passable for him. It is in the best location, however, he stated a three-foot pipe should have been placed beside the structure for the minor drainage. This structure would be considered "seasonally adequate".

REMARKS: The investigator contacted the maintenance engineer and foreman. They stated they have had to pull the owner out of the structure a number of times and that there is nothing they can do with the ice to get it out. Also, in reference to the wash-in of material into the pipe, this too has caused them considerable maintenance expense. They discussed the cost of maintenance for keeping the structure passable and stated they averaged \$500.00 to \$600.00 a year in equipment rental, materials, and manpower, to maintain this structure. This cost rises, depending on runoffs and the ice problem each year.

I 94-4 (7)
MILES CITY-EAST

180" diameter x 326' long, C.M.P.
Stockpass-vehicle-drainage



NORTH ENTRANCE



SOUTH ENTRANCE



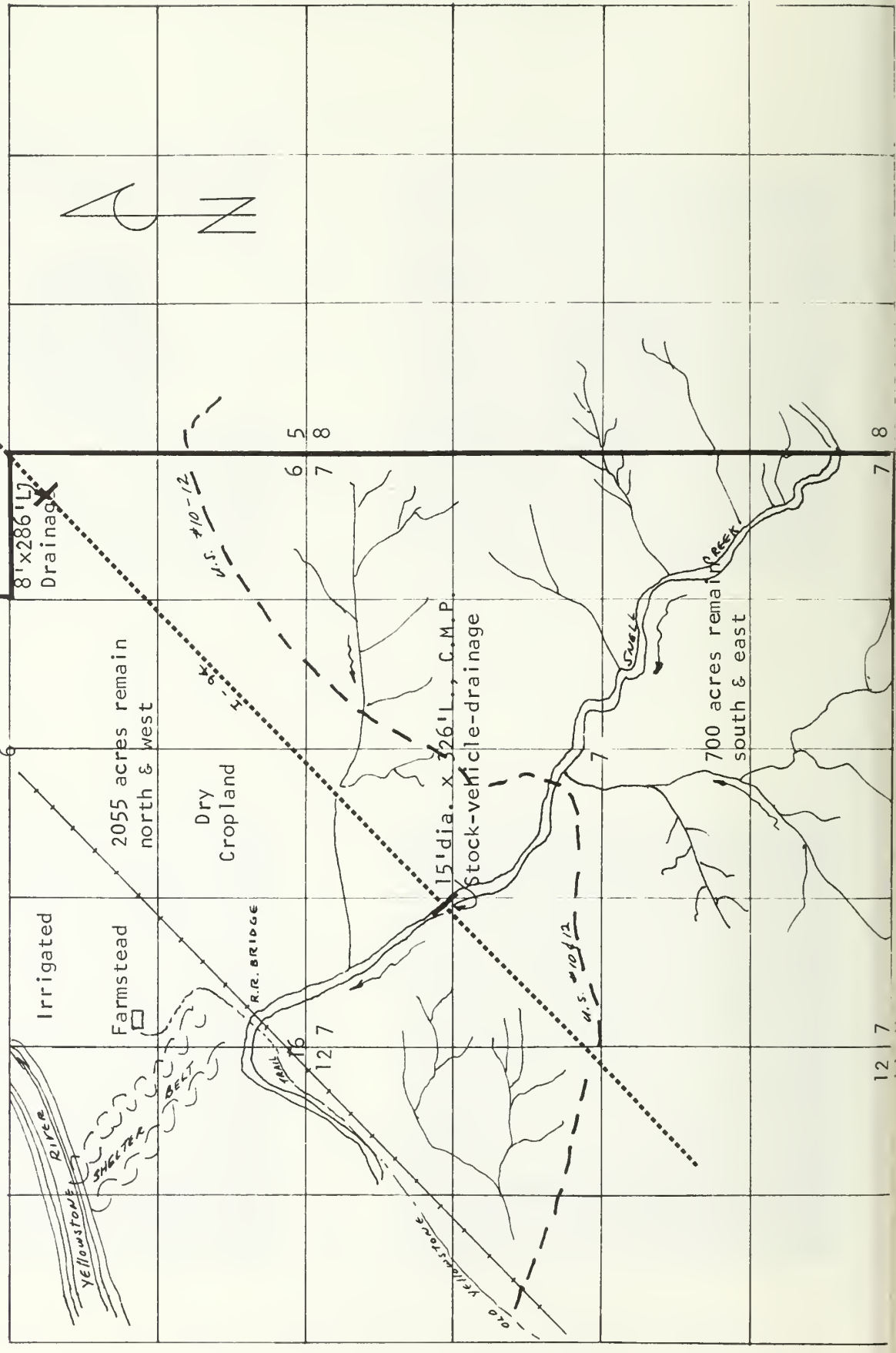
Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1" = 1/4 mile
DATE 10/70
Principal Severance Situation Separation of winter and summer pastures
CASE STUDY NO. 87
STRUCTURE AGE 8 yrs
PROJECT NO. 194-4-(7)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 88 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of summer pasture from main holdings and headquarters. About 2,509 acres remain north and 700 acres remain south.

TYPE OF OPERATION: Cow-calf and yearlings -- about 100 cows and 50 yearlings.

LOCATION: Approximately 11 miles southwest of Miles City, located in Section 31, Township 7 North, Range 46 East, M.P.M., Custer County, Station 726+00 on Project 194-4 (7).

STRUCTURE TYPE: 180" diameter x 180' long, C.M.P., combination stockpass-vehicular drainage. Actual measurement is 14'11" diameter with about 16' of fill on the pipe.

SPECIFIC PROBLEMS: There is no snow problem except on a very hard winter with a lot of snow. However, this is seasonal summer usage by the owner and thus minimizes the snow problem. The property has sold twice in nine years. The owner has also leveled and irrigated more of the river bottom.

ADEQUACY: The present landowner feels it is quite adequate for his operations. The location appears to have been the only feasible one. The owner does not drive his cattle with horses. He works them by hand and uses feed to move them through the structure, along with driving them with his pickup.

REMARKS: This study, though not complex in nature, has a very significant outcome. Few cattle operators drive cattle by hand and/or vehicle, and the fact that this structure user is successful with his size herd shows movement as such is feasible in limited size, weather permitting.

I 94-4 (7)
MILES CITY-SOUTHWEST

180" x 180', C.M.P.
Stock-vehicular-drainage



NORTHERLY ENTRANCE



SOUTHERLY ENTRANCE



Looking North from NORTH ENTRANCE

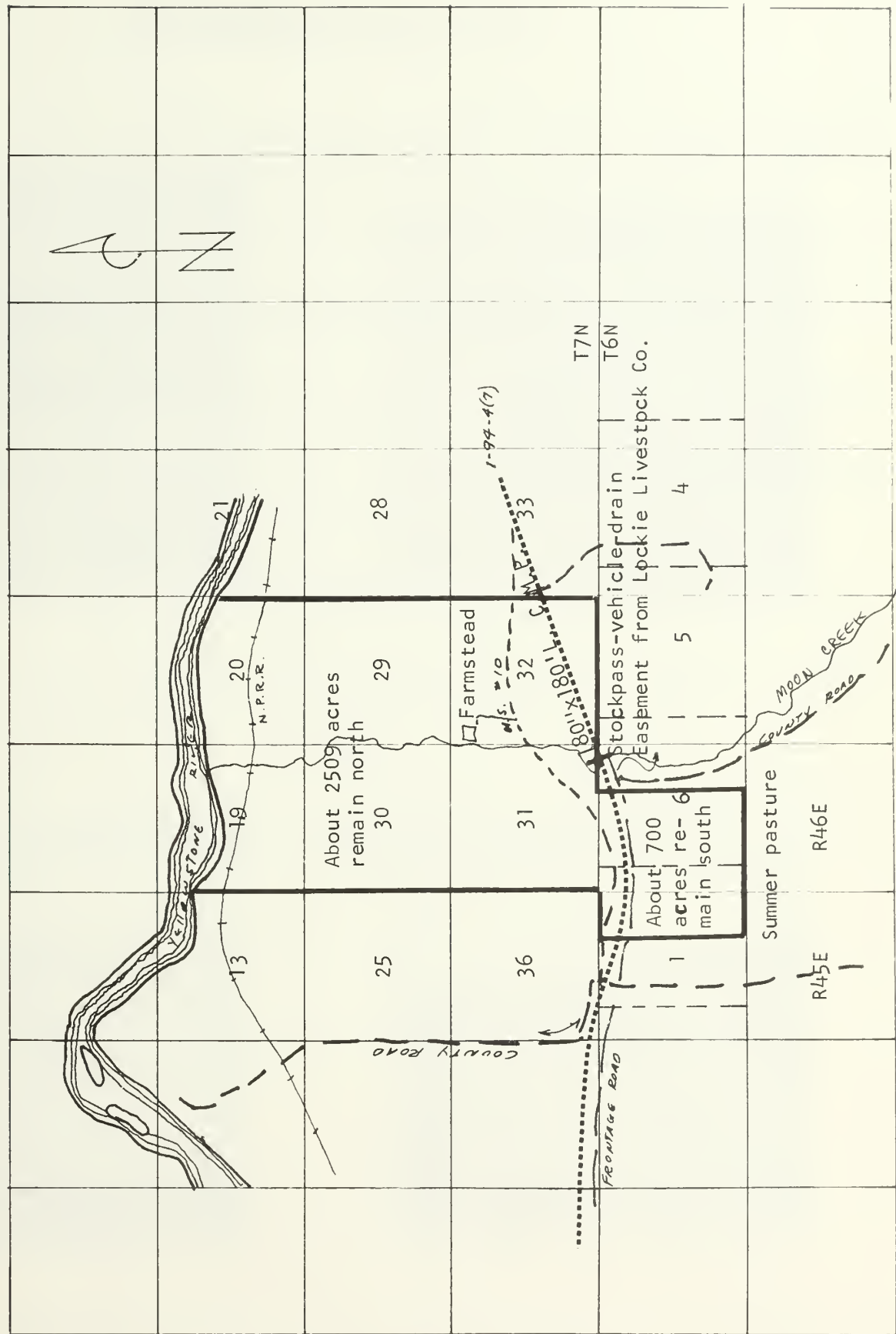


Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Separation of summer pasture from main holdings & headquarters

DATE 10/70 CASE STUDY NO. 88 STRUCTURE AGE 8 to 9 yrs. PROJECT NO. 194-4 (7)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 89 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of a winter pasture from main unit; about 95 acres remain south and 390 acres remain north.

TYPE OF OPERATION: Cow-calf -- 800 cows, and keeps replacement heifers. Non-contiguous lands.

LOCATION: Approximately 13 miles southwest of Miles City, located in Section 33, Township 7 North, Range 45 East, M.P.M., Custer County, Station 513+00 on Project 1 94-4 (7).

STRUCTURE TYPE: 180' diameter x 124' long, C.M.P., combination stock-vehicle-drain usage. About 14'1" actual measurement with about 40' of fill on top.

SPECIFIC PROBLEMS: This structure is fairly good in the summer months with some standing water from springs. In the winter, it builds up with around two feet of ice. The owner stated that when he drives on the ice, he sometimes breaks through in the middle of the structure, and consequently becomes stuck. A four-wheel drive is the desirable vehicle to use to navigate this structure. There should have been a 3' drain pipe adjacent to carry away the minor drainage, according to the investigator.

ADEQUACY: Despite its icy shortcomings, the landowner guessed it was adequate for his needs. This was the only feasible location, but there should have been a drainpipe alongside to carry the minor drainage. The landowner was not overly cooperative and had additional demands to make of the Highway Commission.

REMARKS: Perhaps we are learning that a little spring can mean a big problem in the long run. Again, we must emphasize drainage considerations be analyzed separately from ranch usage.

I 94-4 (7)
MILES CITY-SOUTHWEST

180" diameter x 124' long, C.M.P.
Stock-vehicle-drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



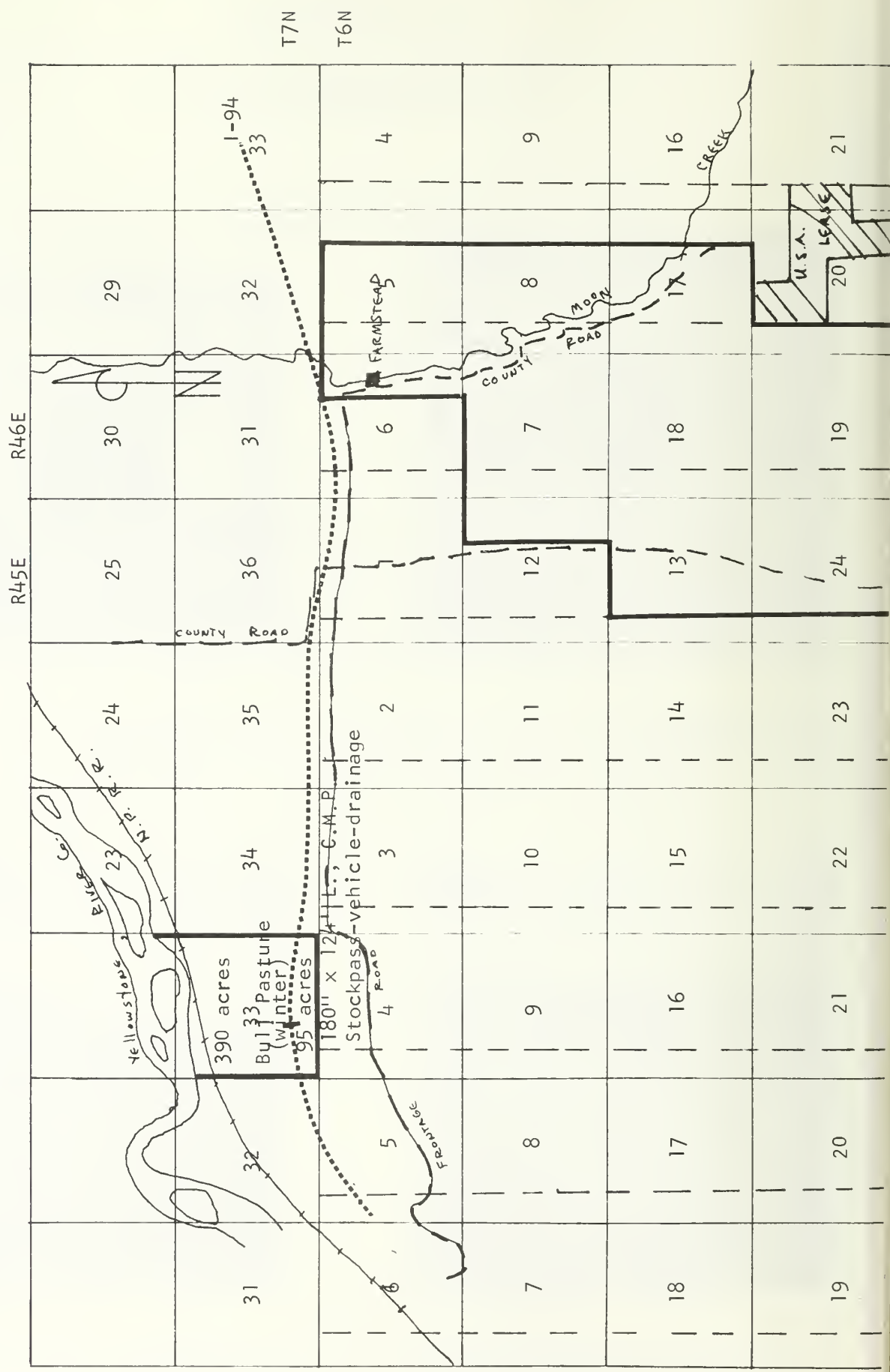
Looking South from SOUTH ENTRANCE

DISTRICT NO. _____

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Separation of winter pasture from main unit

DATE 10/70 CASE STUDY NO. 89 STRUCTURE AGE 8 yrs approx., PROJECT NO. 1 94-4 (7)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 90 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of year around grazing from the experiment station and other grazing lands.

TYPE OF OPERATION: Experiment of cattle production and feeder gain, keep replacement cattle -- 1,200 to 1,300 head: breeding herd with an inventory of 2,600 to 2,700 head of cattle, overall. This is the United States Range Experiment Station.

LOCATION: Southwest of Miles City, located in Section 9, Township 7 North, Range 47 East, M.P.M., Custer County, Station 304+57 on Project 1 ING 94-4 (1).

STRUCTURE TYPE: 16' span x 12' rise concrete box-bridge type structure 44' long. Actual measurements are the same. Stock and vehicular underpass.

SPECIFIC PROBLEMS: Some snow problems; most of the time this is very minor. The underpass does become quite icy in the late winter months by melting snow.

ADEQUACY: The director of the experiment station thought it was fairly adequate except that the structure becomes icy with severe water accumulation. Location is in the most desirable place. There are a total of five land-use structures on this property.

REMARKS: This station is divided into several units of experimentation for range management with the highest production of calf crops and methods of creating larger calves. Also, they experiment with the best methods to produce fast-gaining calves. This would be a natural unit to document any deficiencies or positive features of such structures.

1 ING 94-4 (1)
MILES CITY-SOUTHWEST

16' span x 12' high concrete box 44' L.
Bridge deck, no concrete floor



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 91 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of dry land grazing and improvements from irrigated pastures. About 99 acres remain northerly and 28 acres southerly.

TYPE OF OPERATION: 300 head of dairy cows -- owner sells bull calves and keeps some of the heifer calves for replacement and sale as yearlings. Uses land only for grazing.

LOCATION: One mile southwest of Miles City, located in Section 35, Township 8 North, Range 47 East, M.P.M., Custer County, Station 429+50 on Project 1 ING 94-4 (1).

STRUCTURE TYPE: 20' span x 14' rise x 44' long, concrete box-bridge type span, no floor. Actual measurement is the same. Stock and vehicle usage.

SPECIFIC PROBLEMS: The structure does not fill in too badly with snow; however, the curve north of the structure, leading into the structure, does fill in with snow. The structure itself becomes so icy, you can hardly stand up when trying to walk through. In addition to this icy problem, during the winter both curves into the structure are blind curves, and with ice, have caused six or seven accidents since it was built. Oncoming drivers do not see one another until it is too late.

ADEQUACY: It is considered to be a fair structure for this operation. It is used several times daily but, in the wintertime, it creates quite a problem for safe driving. Visibility is severely limited at the approach. No alternate locations were available. The owner, his neighbor, and sanitary dairy drivers stated the approaches should have a wider, flatter, curve into the structure, with better visibility, particularly because of the icy conditions. The curves do not allow sufficient braking distance when meeting oncoming traffic; conditionally adequate.

REMARKS: There are no warning or speed limit signs at these approaches. The logical recommendation would be to properly sign these curves with a warning sign, and eventually flatten out the curve if it becomes practical and feasible to do so.

1 ING 94-4- (1)
MILES CITY-SOUTHWEST

20' span x 14' rise
Concrete box bridge-type span,
No floor, 44' long



NORTH ENTRANCE



SOUTH ENTRANCE



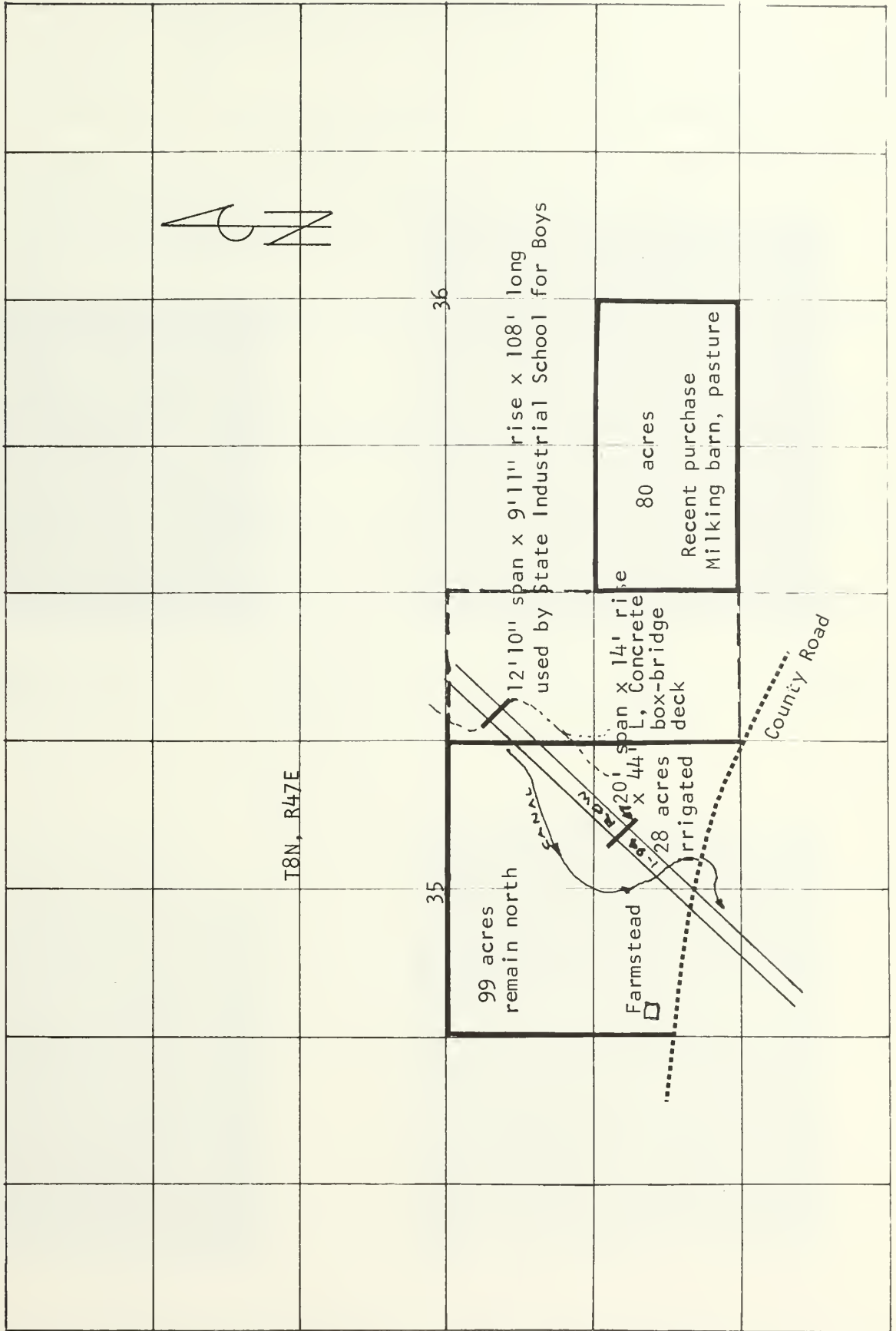
Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1" = 1/4 mile Principal Severance Situation Separation of dry land grazing and improvements from irrigated pastures. PROJECT NO. 1 ING 94-4 (1)
DATE 10/70 CASE STUDY NO. 91 STRUCTURE AGE 10 years



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 92 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of dryland pasture from main irrigated farm.

TYPE OF OPERATION: The new owner just recently purchased the land, and therefore was unable to give any information regarding the stockpass. The primary user, the Pine Hill Boys School, supplied the necessary details. It has fifty to seventy-five cows, which supply milk for the school. Calves are kept for replacement and for the school's meat supply.

LOCATION: About 1 mile south of Miles City, located in Section 35, Township 8 North, Range 47 East, M.P.M., Custer County, Station 455+50 on Project 1 ING 94-4 (1).

STRUCTURE TYPE: 13'10" span x 9'11" rise x 180' long, arch C.M.P., stock-vehicle-drain usage. Actual measurement is 12'8" span x 10' rise, with about 6' of fill over the pipe.

SPECIFIC PROBLEMS: Physical condition of the approach is gumbo dirt, very poor. It is practically impassable when wet and muddy. It is used primarily in the summer months for the young cattle to trail back and forth to water.

ADEQUACY: It is seasonally adequate for their type of operation. Location is OK, however, approach roads should have been graveled.

REMARKS: As stated above, the approach roads should have been graveled. It makes little sense to put in an expensive structure without providing for adequate usage of such.

1 ING 94-4 (1)
MILES CITY-EAST & WEST

13'10" span x 9'11" rise x 108' L.C.M.P.
Stockpass-machinery-drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

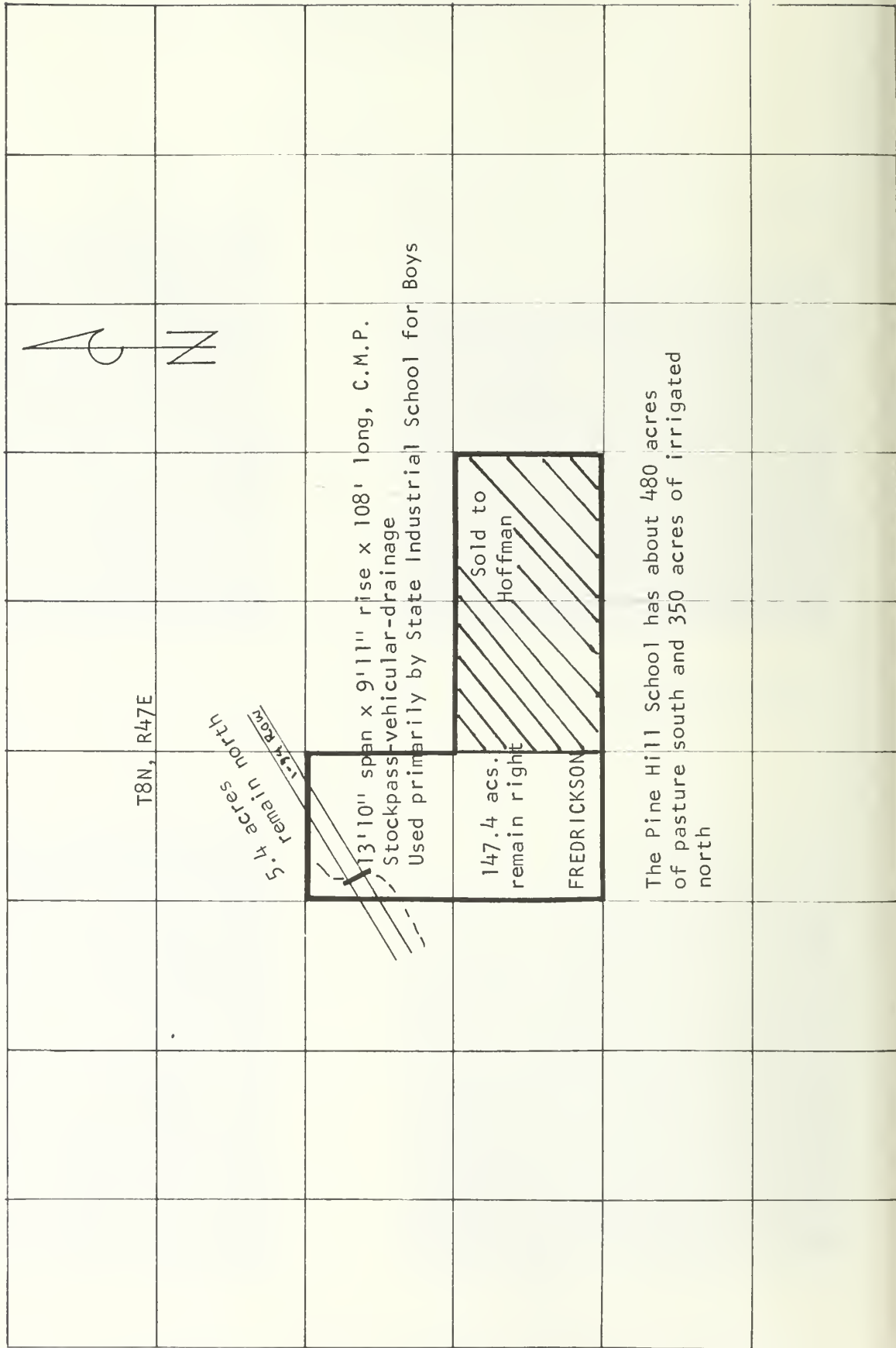


Looking South from SOUTH ENTRANCE
Gumbo road to pasture

OWNERSHIP PLAT

SCALE 1"=1/4 mile Principal Severance Situation Separation of dryland pasture from main irrigated farm

DATE 10/70 CASE STUDY NO. 92 STRUCTURE AGE 9 yrs PROJECT NO. 1 ING 94-4-(1)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 93- Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Dryland pastures separated from irrigated land and headquarters. 103 acres remain north and west and 2,094 acres remain south and east.

TYPE OF OPERATION: Dairy -- 200 milk cows, with bull calves being sold; heifers kept for replacement and sale as milk cows.

LOCATION: Two miles southeast of Miles City, located in Section 25, Township 8 North, Range 47 East, M.P.M., Custer County, Station 495+00 on Project 1 ING 94-4 (1).

STRUCTURE TYPE: 96" diameter x 128' long, round concrete pipe. Stockpass-drainage; actual measurements are 8' span x 7'5" rise (from dirt floor).

SPECIFIC PROBLEMS: The north approach was paved at the owner's expense with about 8 yards of concrete. There is a steady flow of water and both ends become quite muddy. There is about 3" of silt in the bottom. Although the structure stays fairly clear of snow, it does get fairly icy. He stated this does not seem to bother the milk cows, especially since the maintenance forces cleaned the pipe out and paved it with bituminous surfacing (at a cost of about \$250.00).

ADEQUACY: This structure is adequate for his operation; however, he does not have to depend fully on it as there is a large concrete underpass on county road just westerly of this structure that he can get to. Location was satisfactory, except in such boggy areas, paved or concrete aprons are often necessary to get into the structure.

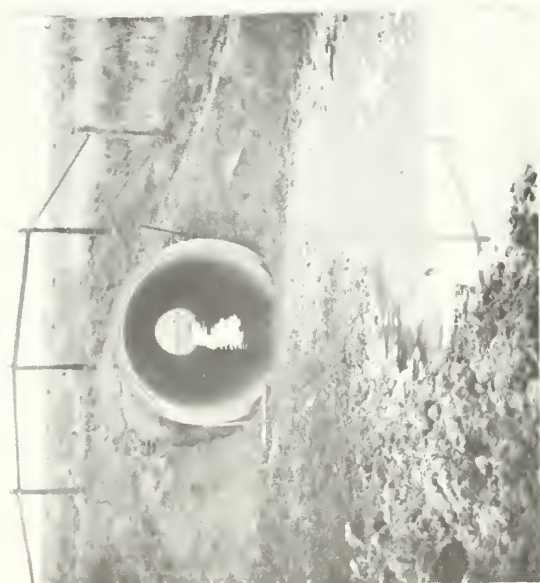
REMARKS: This owner buys most of his grain and hay and winters the young stock and dry cows south of the highway when the winters permit. With this in mind, spring and winter are formidable times of the year for using this underpass. Such intended usage justifies stabilizing the end areas. This is such a small portion of expense of the total cost of the underpass. The owner, in this case, spent about \$250.00 for one end. A total paving stabilization cost of \$750.00 should be justified on the basis of poor utility of the structure without it.



Looking South from SOUTH ENTRANCE



SOUTH ENTRANCE



NORTH ENTRANCE

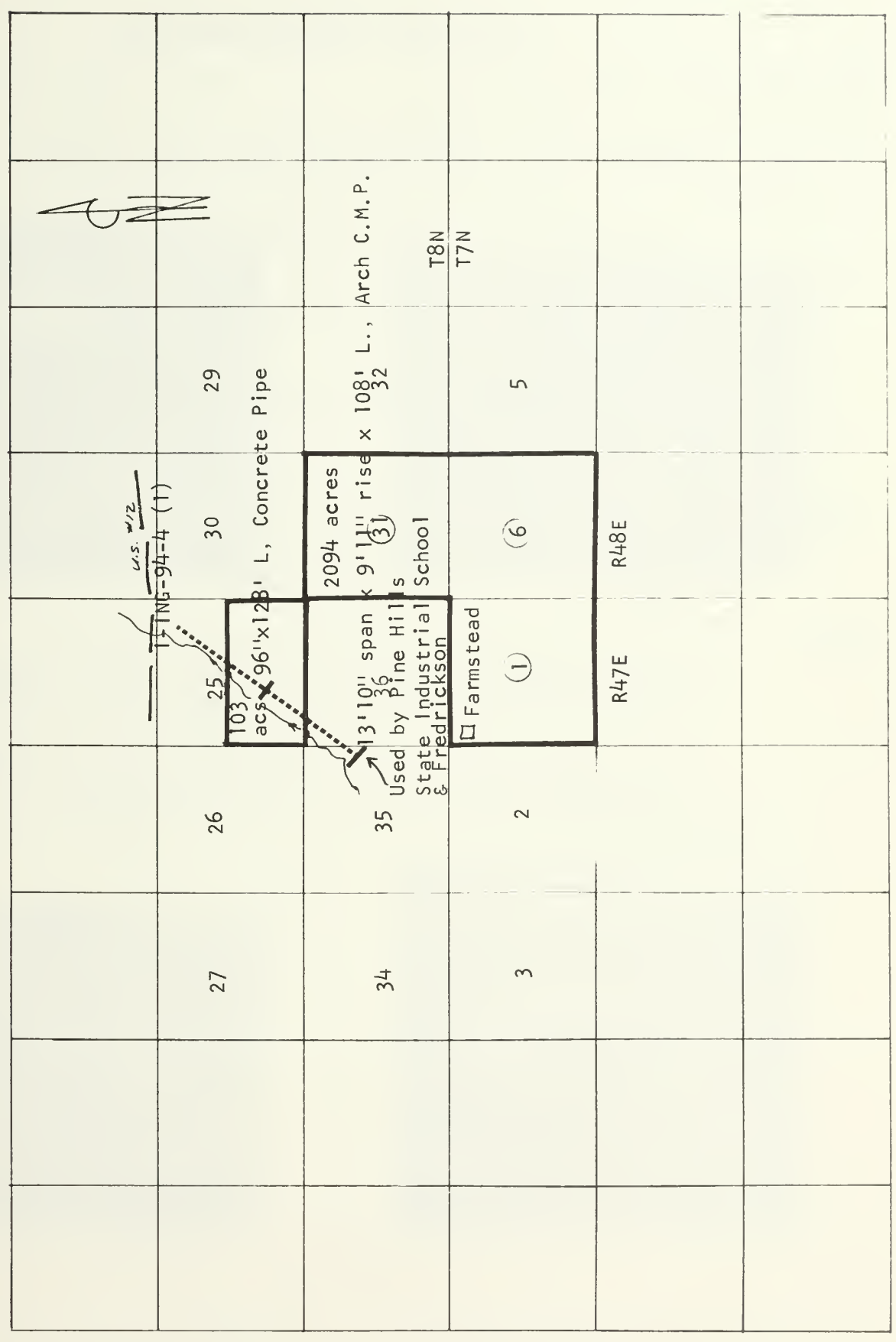


Wide angle view northeast to northwest; residence, sheds, streambed, milking shed

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Dryland pastures separated from irrigated land & headquarters

DATE 10/70 CASE STUDY NO. 93 STRUCTURE AGE 10 yrs. PROJECT NO. ING 94-4 (1)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 94 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of summer pasture from main irrigated unit. About 172 acres remain west and 1,250 acres remain east.

TYPE OF OPERATION: Cow-calf -- he runs 75 head of cows and keeps replacements. All calves are run until yearlings and fed out to the buyer's demands.

LOCATION: About 2 miles southeast of Miles City, located in Section 25, Township 8 North, Range 47 East, Custer County. Station 522+00 on Project 1 ING 94-4 (1).

STRUCTURE TYPE: 14' span x 10' rise x 44' long concrete box. Bridge-type span, no concrete floor. Combination stockpass-vehicular underpass.

SPECIFIC PROBLEMS: No snow problems to speak of and only minor icy problems. Mud and gumbo are the major items of difficulty.

ADEQUACY: The landowner is very happy with the structure and feels it is in the best possible location. There is also a Highway #12 underpass about $\frac{1}{4}$ to $\frac{1}{2}$ mile north. This he would have use of if the underpass area becomes too boggy.

REMARKS: It would not seem too impractical to stabilize these types of structures and approaches with pit-run gravel. The justification of these structures and expenditures on them certainly would justify the small added expense. In most cases, the utility would be increased to the extent that there would be structure users whose opinions of them would change from seasonally or conditionally adequate to completely adequate. This increase in utility alone could justify the costs, looking back at the historical use of the structures.

IRING 94-4 (1)
MILES CITY-SOUTHEAST

14' span x 10' rise x 44' long
Concrete box bridge-type structure



NORTH ENTRANCE



SOUTH ENTRANCE



Looking South from SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 95 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of summer pasture from main unit; about 40 acres remain north and west and 470 acres remain south and west.

TYPE OF OPERATION: Cow-calf -- this owner runs approximately 35 to 40 cows, keeping some replacements. This is a part-time unit and he has a regular job in Miles City.

LOCATION: 13 miles east of Miles City, located in Section 28, Township 9 North, Range 48 East, M.P.M., Custer County, Station 922+75 on Project 1 ING 94-4 (1).

STRUCTURE TYPE: 180" diameter x 116' long, arch C.M.P., stock and vehicle underpass. Actual measurements are 14'2" span x 13'7" rise with 5' of cover.

SPECIFIC PROBLEMS: This structure is primarily seasonal usage because the landowner does not use it during the winter months. He did state that the underpass seems to stay fairly clear of snow. The main snow problem is the approach road from the easterly direction, along the interstate fence and high, steep hill on the south side of the interstate.

ADEQUACY: The structure seems to serve his present needs; no comment was made on choice of location. The owner seems satisfied with the structure; however, the land does not provide his livelihood, nor is the structure crucial to the ranching unit. The land purchase appears to be a rural living amenity and speculative interest. It is an adequate structure.

REMARKS: This structure has been in use ten years and may be obsolete for agricultural purposes within the next ten. Perhaps an economic life can be estimated for land-use structures in the initial justification. A cost per year may then be determined to evaluate the structure's actual potential as a contributing improvement to the land, i.e. the higher the cost per year, the more marginal the justification.

LINE 94-4 (1)
MILES CITY-EAST

180" x 116' long, C.M.P.
Stockpass-vehicle usage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

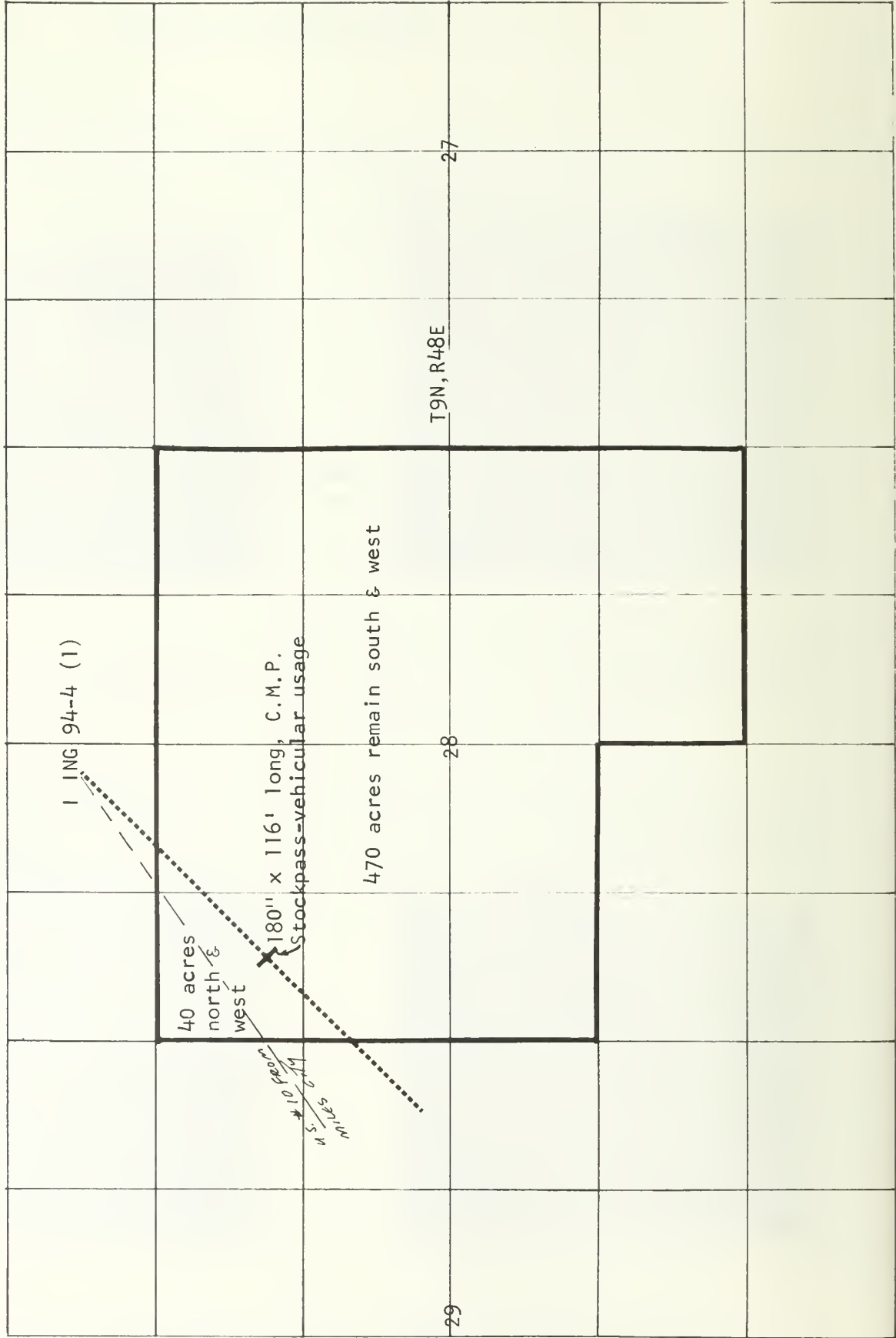


Looking Southeasterly from SOUTH ENT.,
Note approach cut into hillside along
Interstate fence line.

OWNERSHIP PLAT

SCALE 1" = 1/4 mile Principal Severance Situation Separation of summer pasture from main unit

DATE 10/70 CASE STUDY NO. 95 STRUCTURE AGE 10 yrs. PROJECT NO. 1 ING 94-4 (1)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 96 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: All season grazing pastures separated from main irrigated farm unit. About 594 acres remain west and 3,970 acres remain east.

TYPE OF OPERATION: This owner runs 300 head of cows, keeping all calves til yearlings, keeping replacements and selling some of the remainder along with killing for a customer butchering service.

LOCATION: Two miles southeast of Miles City, located in Section 24, Township 8 North, Range 47 East, M.P.M., Custer County. Station 580+00 on Project 1 ING 94-4 (1).

STRUCTURE TYPE: 15'6" span x 13'10" rise x 108' long, C.M.P., stock and vehicular usage. Actual measurements are 14'19" span x 11'4" rise (south) and 10'8" (north) from roadbed. 4' of fill on top of pipe.

SPECIFIC PROBLEMS: Most of the time the structure stays fairly clear. The south approach, however, does fill with snow and the landowner then has to use the interchange at Highway #12. Mud is the largest deterrent to usage during wet weather, along with snow problems and melting snow. The bottom of the structure was cleaned out by maintenance people. This was a difficult job, and after cleaning they put in bituminous surfacing in the bottom with gravel on the surface. Total cost was estimated at about \$350.00 for hand labor, trucks, gravel, and surfacing. The landowner stated that water now stands in the pipe, along with the silt. It is soft to a depth of 6 to 8 inches. He felt it would have been better to put in a gravel base and surfacing on top to firm up the bottom, eliminating the silting drain pattern and muddy bottom.

ADEQUACY: This structure would have to be considered "seasonally" adequate. It is usable during dry weather, a nuisance during wet weather, and impassable during heavy snowfall and/or bad winter weather. The landowner is not necessarily unhappy about these conditions because it does provide some access to his severed lands. All machinery, except trucks and cats, is taken to the interchange crossing for access to the 594 acres of deeded and 5,500 acres of leased grazing land.

REMARKS: Whereas gravel has been hauled in for access footing, the structure still appears deficient from a drainage standpoint. Its usage was not intended to be a drain structure, but there is apparently insufficient slope to drain water through and into a drain ditch. From all appearances, this does not appear to be a correctable situation. There were better locations on neighboring lands, but this was the only feasible location on his own land. Possibly during construction more thought could have been given to proper drainage away from the structure.

1 ING 94-4 (1)
MILES CITY-SOUTHEAST

15'6" span x 13'10" rise x 108' L.
Arch C.M.P.
Stock and vehicle usage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1"=1 mile

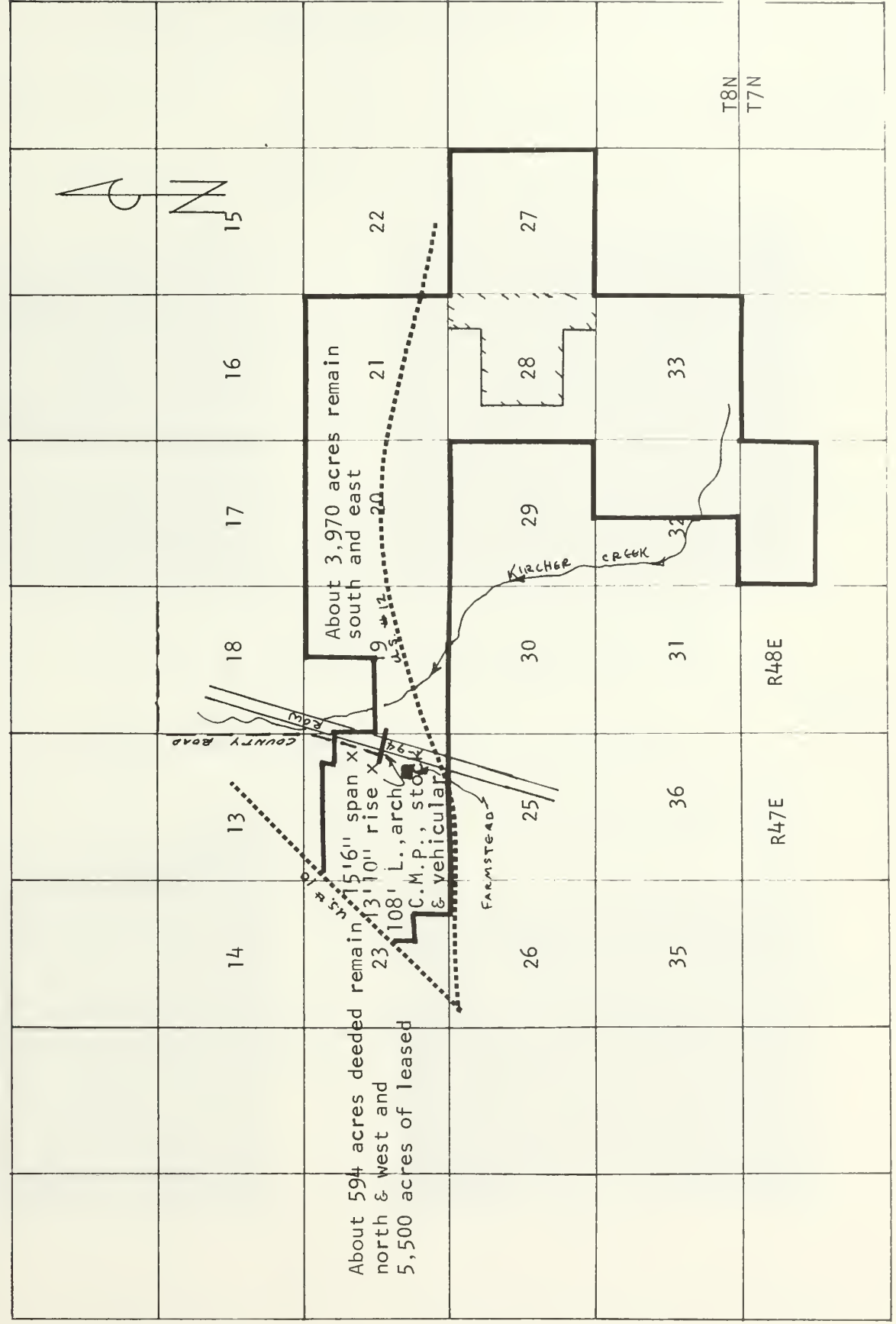
Principal Severance Situation All season grazing pastures from main irrigated farm unit

DATE 10/70

CASE STUDY NO. 96

STRUCTURE AGE 9 years

PROJECT NO. 1 ING 94-4 (1)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 97 - Controlled Access -- Two Lanes DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Land-locked headquarters; however, this stockpass is located on an existing farm lane and provides access to existing highway. About 12 acres remain north of right-of-way and 279 acres remain south.

TYPE OF OPERATION: Diversified cow-calf (35 cows), 2 or 3 horses, 100 to 150 head of sheep.

LOCATION: Near the town of Big Horn, located in Section 33, Township 4 North, Range 34 East, M.P.M., Yellowstone County, Station 290+00 on Project 194-1 (4)

STRUCTURE TYPE: 16'2" span x 14'10" rise x 180' long, arch C.M.P., stockpass-vehicular-drainage. Actual measurements were the same with about 10' of fill over the pipe.

SPECIFIC PROBLEMS: The owners found that an older 12' combine would not go through because the machine did not have a folding auger. They also cannot get the sugar beet topper through because it is too wide. Otherwise, it will pass all their other trucks and vehicles, including a double-deck stock semi. The snow blow-in is not bad; however, the small pipe set below the big pipe often plugs up, then the water backs up and runs through the big pipe and freezes, making the approach icy on the north end. The south end melts off most of the time.

ADEQUACY: The landowner is very unhappy with the Highway Commission for a number of reasons, and will be more so when the other two lanes are built because it will be so far around for them to drive. They found that they could cross a neighbor's land to take their oversize farm machinery to a county road and then go up to the Hardin Junction, and then cross to the north side of the road. The same neighbor also crosses their land during irrigation season to go up their road through the pipe because the county road west is too wet and muddy. This structure would have to be considered "conditionally adequate". This is the only access from the highway to headquarters and he is limited to what he can take through.

REMARKS: The investigator was of the opinion that the owner would have preferred damage payment in preference to the present situation. Nevertheless, short of a bridge installation, this seems to be as good a structure as was feasible under the circumstances. Cost of structure to ranch value was about 62%.

I 94-1 (4)
BIGHORN-WEST

16'2" span x 14'10" rise x 180' long,
Arch C.M.P.
Stock-vehicular-drainage



NORTH ENTRANCE



SOUTH ENTRANCE

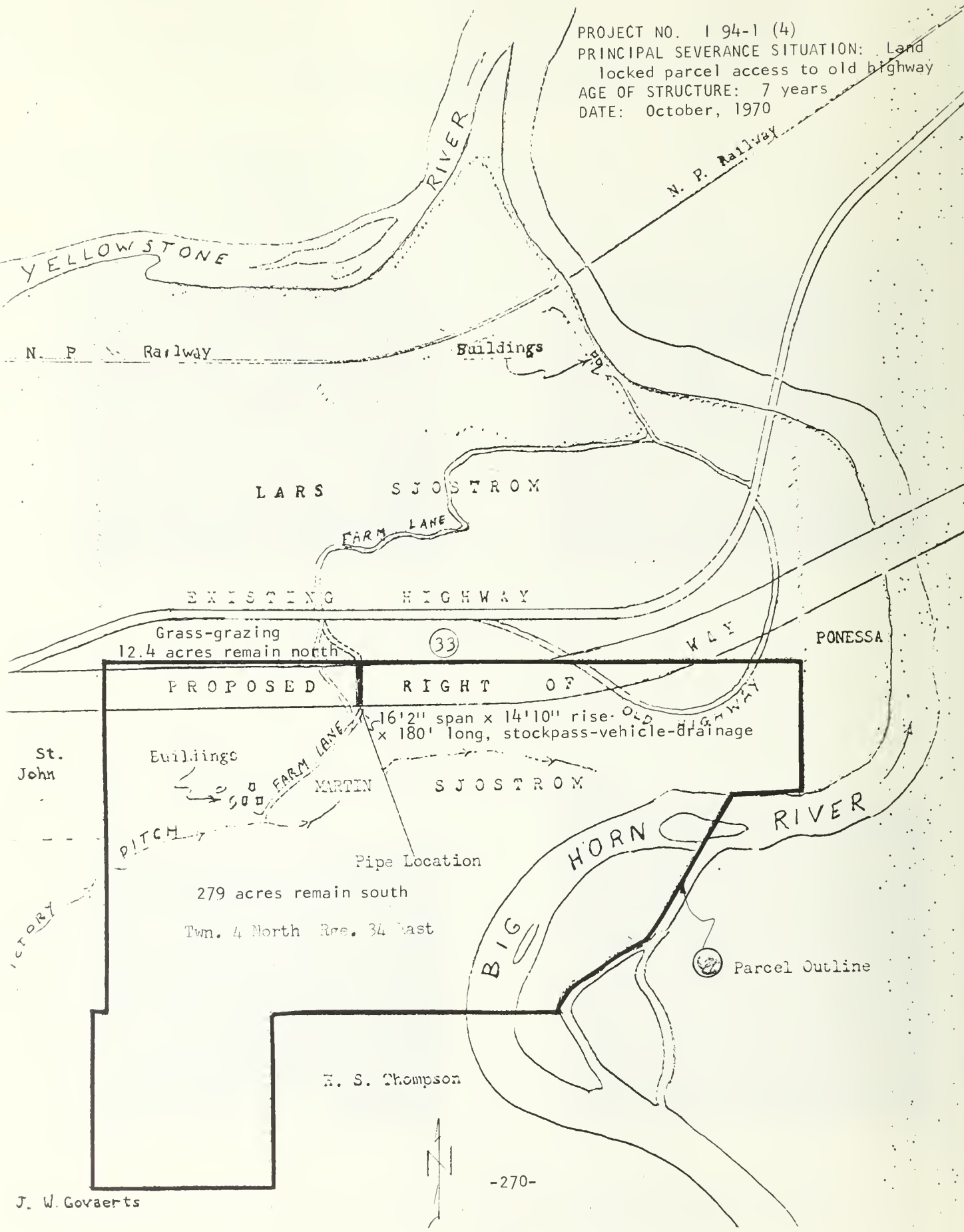


Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

PROJECT NO. 194-1 (4)
 PRINCIPAL SEVERANCE SITUATION: Land
 locked parcel access to old highway
 AGE OF STRUCTURE: 7 years
 DATE: October, 1970



J. W. Govaerts

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 98 - Controlled Access -- Four Lanes DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separated winter pastures, about 215 acres remain north and 169 acres remain south.

TYPE OF OPERATION: Cow-calf -- about 400 head of cows.

LOCATION: Near Ballantine, located in Section 5, Township 2 North, Range 29 East, M.P.M., Yellowstone County, Station 1968+30 on Project I NG 94-1 (12).

STRUCTURE TYPE: 20'5" span x 13'0" rise x 210' long, squash C.M.P., stock-vehicular usage; also carries overflow drainage from Arrow Creek. Actual measurements are the same, with about 3' of fill.

SPECIFIC PROBLEMS: The pipe fills in with snow but not to the point where cattle will not use it. Neither does it get so bad that trucks cannot get through. The ice buildup is generally very bad, as is the drainage situation. The owners have found that their cows will walk through this pipe in some water but will not if the water gets too deep.

Because the right-of-way separates the irrigated winter feeding ground, multiple type of usage would normally be required of it. The owners found that their combine and farm truck will not clear this pipe because of height, and required a 5-mile circuitous travel route. The pipe also runs as much as half full from the Arrow Creek runoff. After the periodic flooding of Arrow Creek, the approaches are generally in bad shape. The owner feels this could be eliminated to some extent by extending the pipe floor paving out from the pipe ends further. It is fairly obvious that the 36" drain pipe lying about 100 feet west of the big pipe is grossly inadequate to drain this area and would also freeze up rapidly in the winter. They also have about 3½ sections of land southeast and not contiguous which requires access by this pipe.

ADEQUACY: The pipe is seasonally adequate due to the physical changes in the approaches from Arrow Creek. The stockwater source is on the south side of right-of-way and the cows pass through the pipe on their own when conditions are not severe. Adequate for stock, inadequate for machinery.

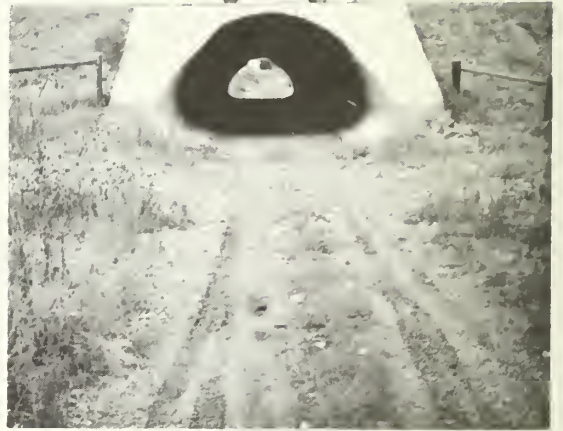
REMARKS: Without looking at the economics of the operation and subsequent justification, it appears the structure would be less than adequate. Keep in mind this is a 40-head part-time unit, and whereas the highway didn't severely alter the ranching operation, it certainly didn't improve the place either. A smaller structure would not seem feasible, nor would a larger one. However, a taller arch pipe of comparable cost would have more than likely found higher utility.

LINE 94-1 (12) 13
BALLANTINE-EAST & WEST

20'5" span x 13'0" rise x 210' long
Squash C.M.P.
Stock-vehicle & drain usage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE
towards Ballantine

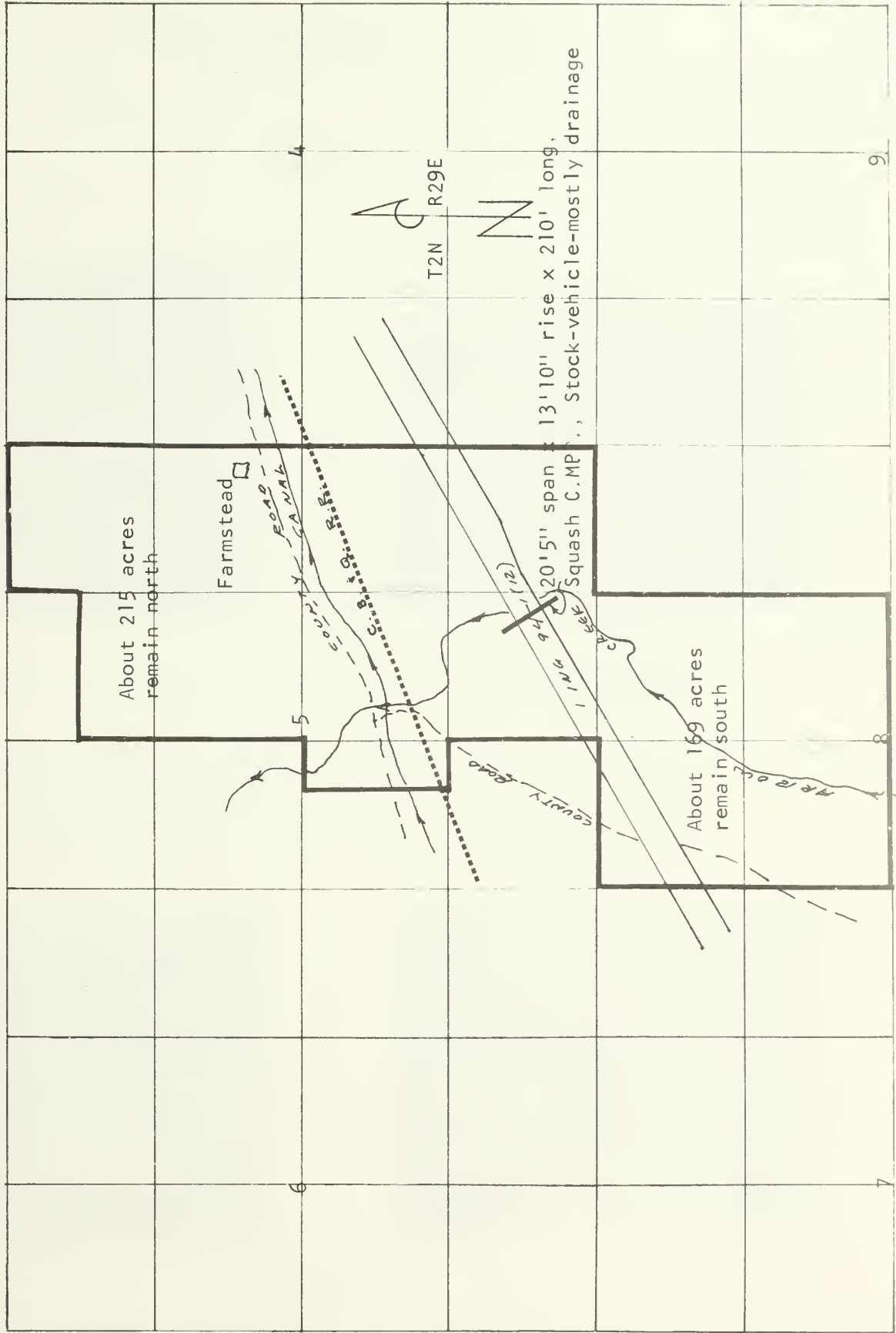


Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1" = 1/4 mile Principal Severance Situation Separation of winter pastures

DATE 10/70 CASE STUDY NO. 98 STRUCTURE AGE 3 yrs. PROJECT NO. 1 ING 94-1 (12)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 99 - Controlled Access -- Four Lanes DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures, about 220 acres remain north and 60 acres remain south.

TYPE OF OPERATION: Cow-calf -- about 35 head of cows, and also farms. (See plat).

LOCATION: Near Huntley, Section 29, Township 2 North, Range 28 East, M.P.M., Yellowstone County. Station 1569+90 on Project 194-1 (10).

STRUCTURE TYPE: 180" diameter x 240' long, C.M.P., stockpass-vehicular-drainage; actual measurement was 180" with about 6' of fill over pipe.

SPECIFIC PROBLEMS: Drills and Graham plows are apparently too wide for this structure and have to travel about 5 miles to one of the two crossings. The present owner does not use the pipe in the winter, but a neighbor uses this pipe every day to check his cattle that are south of the interstate. In the spring runoff, the approaches are not too good. A flash runoff washed the blacktop out of the pipe, and it has never been replaced. Thus, when the drainage pipe is wet, it is impassible for vehicles. The location is adequate but would have served the owner's operation better $\frac{1}{2}$ mile farther east.

ADEQUACY: It is considered seasonally adequate. Cattle will go through readily. a 14' combine with header off will go through, as will most grain trucks, tractors, etc.

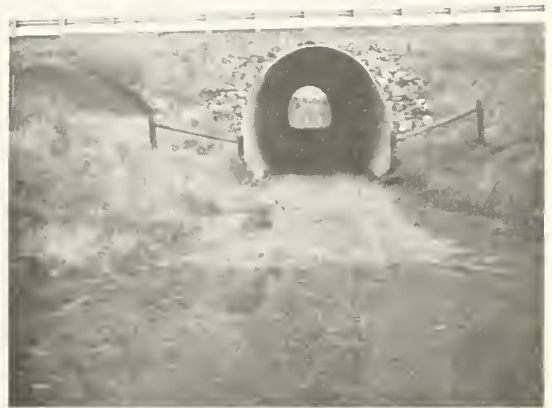
REMARKS: Whereas the photos show a good gravel approach surfacing, the south to north drainage pattern renders this inadequate during heavy rains. The location appears reasonable, but drainage consideration may have allowed this to be usable during wet periods. A separate drain pipe may have worked in this instance, if there was a place for the drainage to go north of the right-of-way.

I 94-1 (10)
HUNTLEY-EAST

180" diameter x 240' long
Round C.M.P.
Stock-vehicular-drainage



NORTH ENTRANCE



SOUTH ENTRANCE

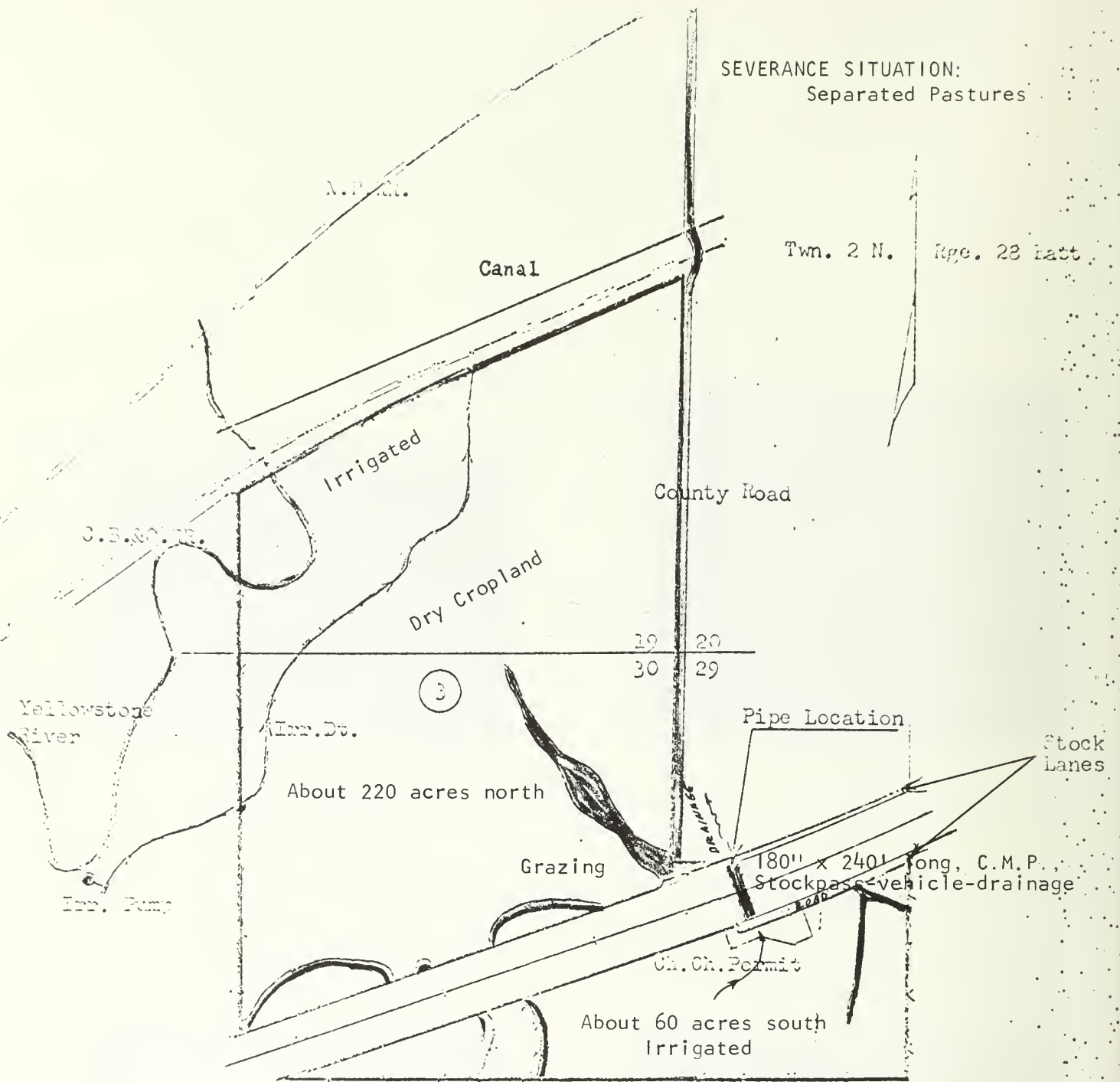


Looking North from NORTH ENTRANCE
Notice stocklane approaches



Looking South from SOUTH ENTRANCE
Notice stocklane approaches

SEVERANCE SITUATION:
Separated Pastures



Project: I-94-1(10)6
Huntley-Ballantine

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 100 - Non-Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures; about 154 acres remain north and 315 acres remain south.

TYPE OF OPERATION: Cow-calf -- this parcel is operated with another adjoining parcel - The owner runs about 200 head of cows and calves.

LOCATION: East of Raynesford, located in Sections 6 and 7 of Township 17 North Range 9 East, M.P.M., Judith Basin County. Station 799+90 on Project F 235 (21).

STRUCTURE TYPE: 5'10" span x 6'6" rise x 86' long, arch C.M.P., Type "A" stockpass. Actual measurements are the same with about 2' of fill over pipe.

SPECIFIC PROBLEMS: The pipe has never been used. There are two ownerships involved and they may get together on using it before too long. The owner appeared very hostile and was not overly cooperative. He did mention the stockpass was insisted upon as "insurance" in case he or his brother would ever need it. A partnership and estate have not been straightened out yet, so the acreages of this parcel are open to question.

ADEQUACY: The adequacy cannot be determined without actual usage. Locational factors were not discussed. It could be considered "conditionally adequate".

REMARKS: The cost of this stockpass to ranch value ratio was about 17% based on 1962 costs, and therefore not out of line with other similar installations on a ratio comparison basis. All the necessary ingredients of a functional stockpass are present. Adequate footing, grassed approaches, low drainage problems because of the shallow drainage area.

F 235 (21)
RAYNESFORD-EAST

5'10" span x 6'6" rise x 86' long,
Type "A", stockpass-drainage



NORTH ENTRANCE



SOUTH ENTRANCE



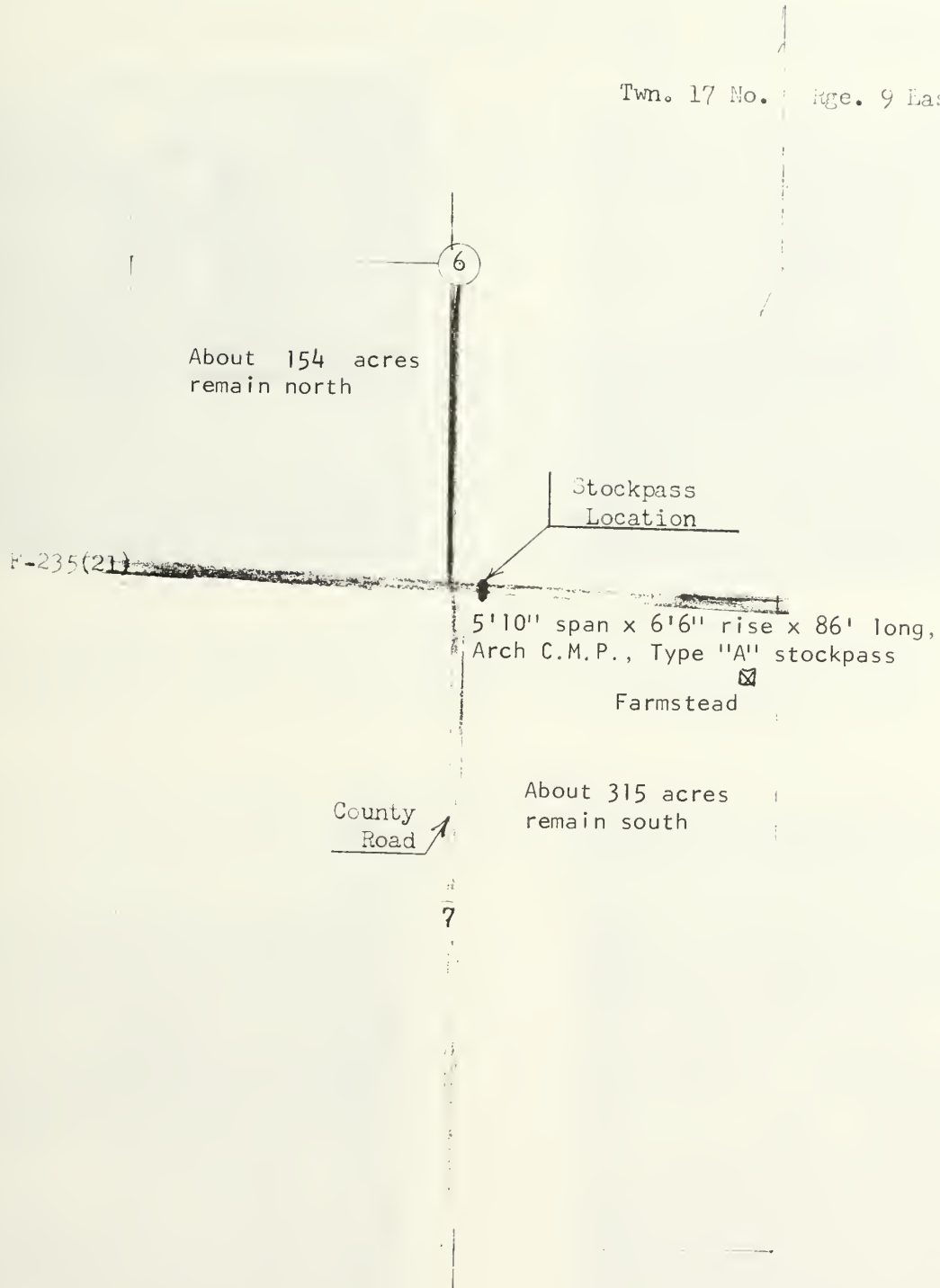
Looking North from NORTH ENTRANCE
Notice fencing



Looking South from SOUTH ENTRANCE

CASE STUDY No. 100
PRINCIPAL SEVERANCE SITUATION: Separated pastures
STRUCTURE AGE: 8 years
DATE: October, 1970

Twn. 17 No. Rge. 9 East



Scale 1" = $\frac{1}{4}$ mile

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 101 - Non-Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures; about 360 acres remain north and 382 acres remain south.

TYPE OF OPERATION: Cow-calf -- about 38 head plus farming.

LOCATION: West of Geysler, located in Sections 4 and 9, Township 17 North, Range 9 East, M.P.M., Judith Basin County, Station 910+00 on Project F 235 (21).

STRUCTURE TYPE: 5'10" span x 7'7" rise x 76' long, arch C.M.P., Type "B" stockpass-drainage.

SPECIFIC PROBLEMS: The original owner sold this land while the project was being built. The present owner is in poor health and not capable of much exertion. There is about 40 acres of grass to the south out of 382 acres that is worth grazing, and it appears it is not worth the owner's time to use the stockpass to utilize these areas. He apparently farms the major portion of it. Water from the shallow drainage area presents a continuous problem to the extent that water stands in the pipe, and a small creek runs through the pipe at all times. At the date of inspection, there was about 14" to 15" of running water in the pipe.

ADEQUACY: It is difficult to determine the adequacy without the pipe being used. If it must be classified, the running water would classify the structure inadequate as a stockpass and superadequate for drainage. The owner does not intend to use it.

REMARKS: This has been in place and unused for 8 years. Obviously, a drainpipe would have sufficed, but at the time of construction, the owner intended to use it, and sold the property instead. The present owner chose not to use it, probably for good reason.

F 235 (21)
GEYSER-WEST

5'10" span x 7'7" rise x 76' long,
Arch C.M.P.
Type "B" Stockpass-drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE
Notice through fencing



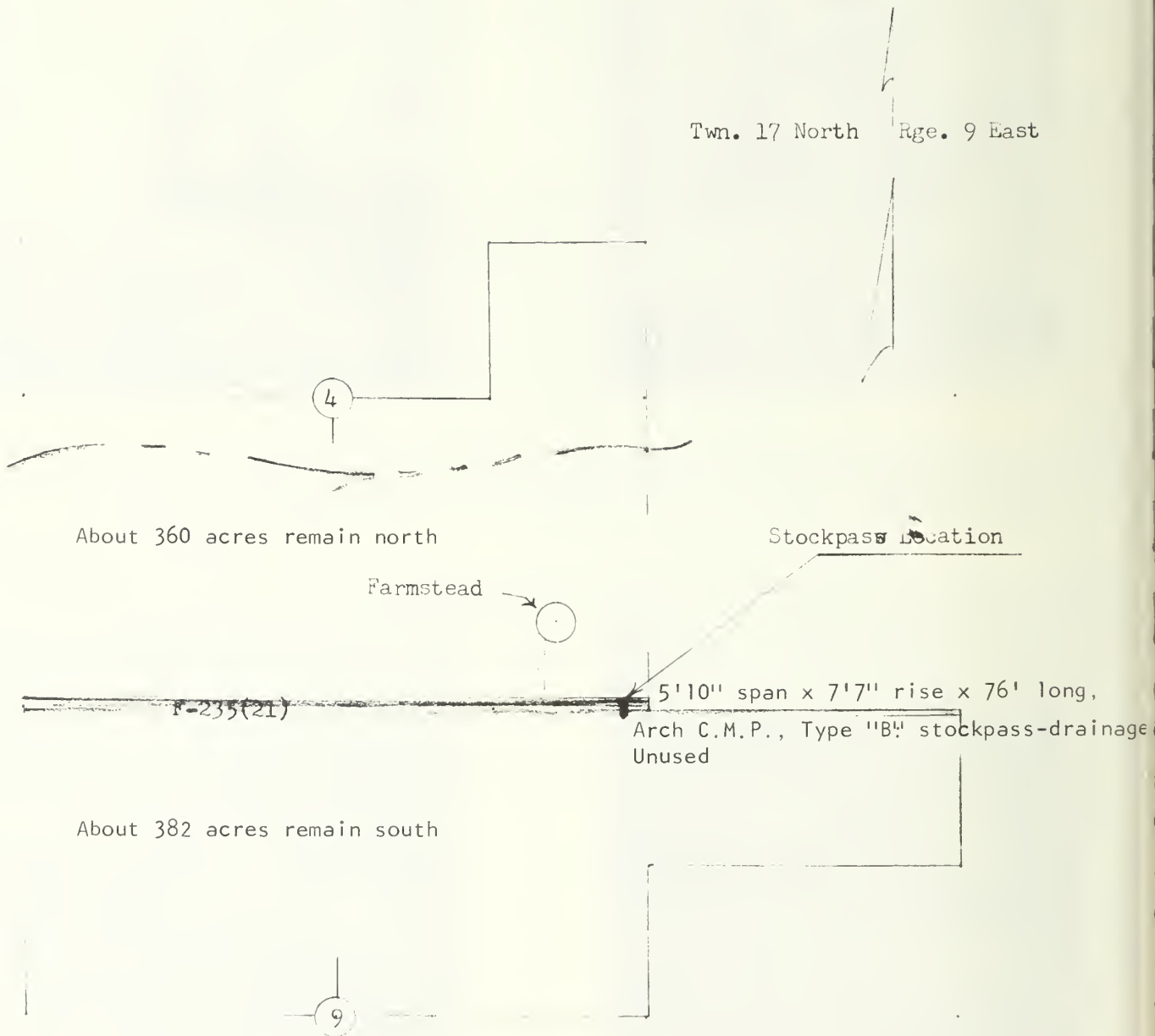
Looking South from SOUTH ENTRANCE
Notice through fencing

CASE STUDY No. 101

PRINCIPAL SEVERANCE SITUATION: Separated pastures

STRUCTURE AGE: 8 years

DATE: October, 1970



Scale 1" = $\frac{1}{4}$ mile

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 102 - Non-Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures; about 157 acres remain north and 315 acres remain south.

TYPE OF OPERATION: Cow-calf -- about 30 head plus farming.

LOCATION: West of Geyser, located in Sections 5 and 8 of Township 17 North, Range 9 East, M.P.M., Judith Basin County, Station 875+50 on Project F 235 (21).

STRUCTURE TYPE: 5'10" span x 7'7" rise x 76' long, arch C.M.P., Type "B" stockpass-drainage.

SPECIFIC PROBLEMS: Because of design, the stockpass could not be put where the owners wanted it. The pipe was cut into a flat area, and approaches daylighted by the cuts north and south. This was about $\frac{1}{4}$ mile east of where the owner wanted it. Because they needed the pipe to cross the highway with the cows and calves after birth in spring (they calved at the farmstead), it would be necessary to run cows and calves through mud and snow for the $\frac{1}{4}$ mile and back to the barns to the south (see plat). The owner decided this was not convenient, so the stockpass has never been used.

ADEQUACY: Inadequate for present operation. The owner has figured out a cart-like conveyance which he loads the new calves into, makes a fast dash across the highway, and the mothers follow at a fast pace. This seems to be much better than fighting the mud and snow up to the stockpass and back to the barns. The herd is apparently not large enough, and moves fast enough, so as not to present a traffic hazard. This stockpass would have to be considered inadequate for the type of ranching operation, because of location. No other location was considered feasible because of grade.

REMARKS: Damages in lieu of the stockpass probably would have been the better solution in this situation. It is obvious he has found a better, more convenient, method of management than utilizing the stockpass.

F 235 (21)
GEYSER-WEST

5'10" span x 7'7" rise x 76' long
Arch C.M.P.
Type "B" stockpass (unused)



NORTH ENTRANCE



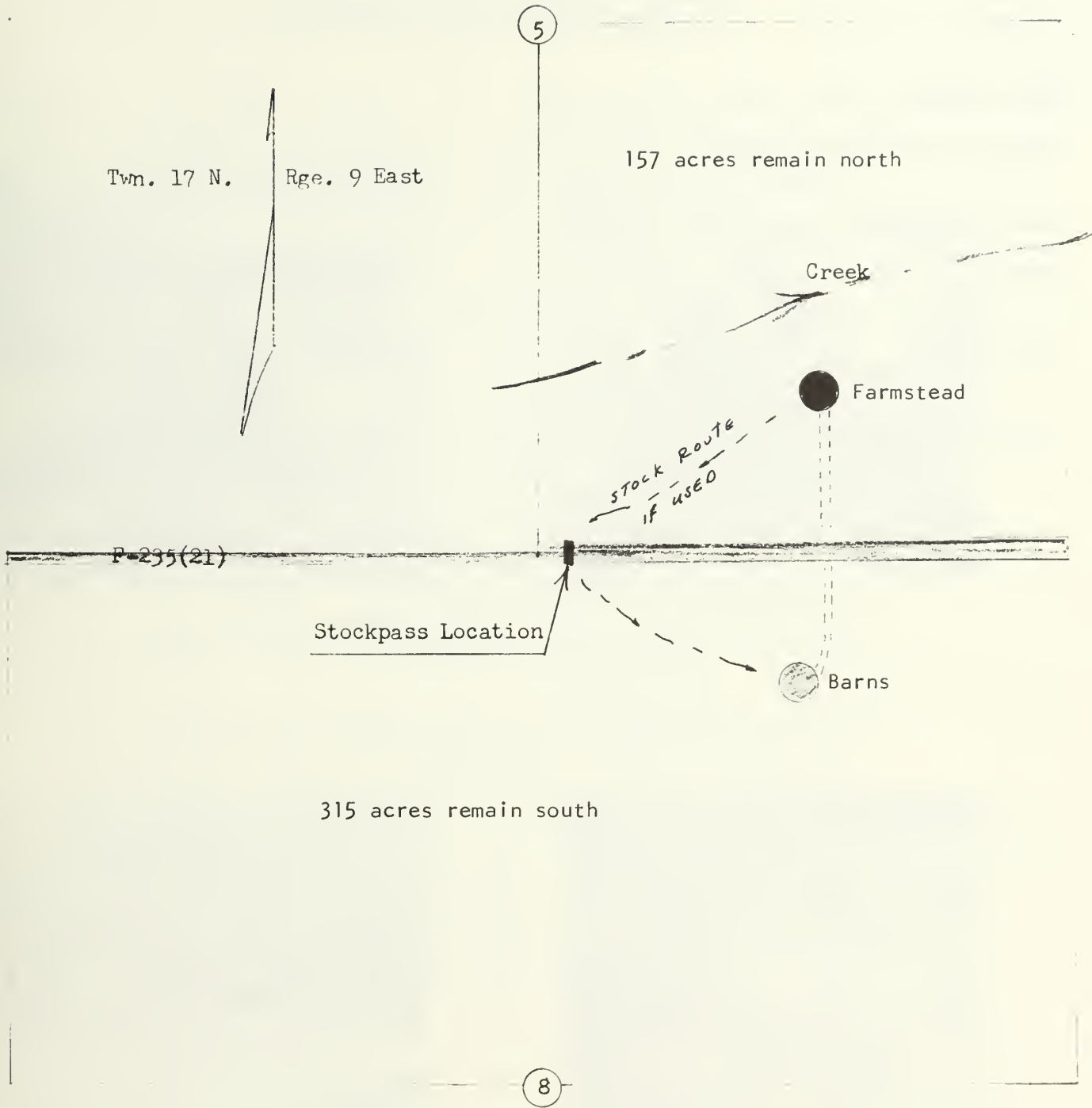
SOUTH ENTRANCE



Looking South from SOUTH ENTRANCE
Notice through fencing



Looking North from NORTH ENTRANCE
Notice through fencing



CASE STUDY NO. 102
 PRINCIPAL SEVERANCE SITUATION: Separated pastures
 STRUCTURE AGE: 8 years

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 103 - Non-Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Summer pastures separated from headquarters and pastures. About 97 acres remain west and 311 acres remain east.

TYPE OF OPERATION: Cow-calf -- 100 cows and calves.

LOCATION: Near Raynesford, located in Section 3, Township 17 North, Range 8 East, M.P.M., Judith Basin County, Station 659+54 on Project F 235 (21).

STRUCTURE TYPE: 5'10" span x 7'7" rise x 92' long arch C.M.P., Type 'B' stockpass-drainage. Actual measurements are the same with about 5' of cover.

SPECIFIC PROBLEMS: The spring and summer pasture on the west side is very hard to use because of the pipe snowing in on the west end. It is bad enough that the structure is generally unusable in the early spring. The owner shovels the snow out and the snow plow fills it back in again, making a more compacted snow to shovel out. Pasture rotation is impractical, so the owner is using this as best he can. Needless to say, he is unhappy with the Highway Commission. He feels a 20' extension to the west would alleviate the snow problems to some extent. If the pipe plugs up with snow, there is no other way to get the stock across the road.

ADEQUACY: This underpass would have to be judged "seasonally adequate". The investigator felt the installation to be a very poor engineering job in general. The size is acceptable, but snow is in the structure when he needs it. The location is about the best possible place.

REMARKS: Some of the snow problem is curable, either by marking the stockpass to prevent the snowplow from filling it, or by extending it westerly. In that the westerly draw has a deep slope, it is unlikely that a dug-in approach would be of any greater utility than the present one. This was judged to be the best of locations, so it is possible there is no curable feature other than the plowing.

F 235 (21)
RAYNESFORD-EAST

5'10" span x 7'7" rise x 92' long
C.M.P., Type "B" stockpass-drainage



EAST ENTRANCE



WEST ENTRANCE

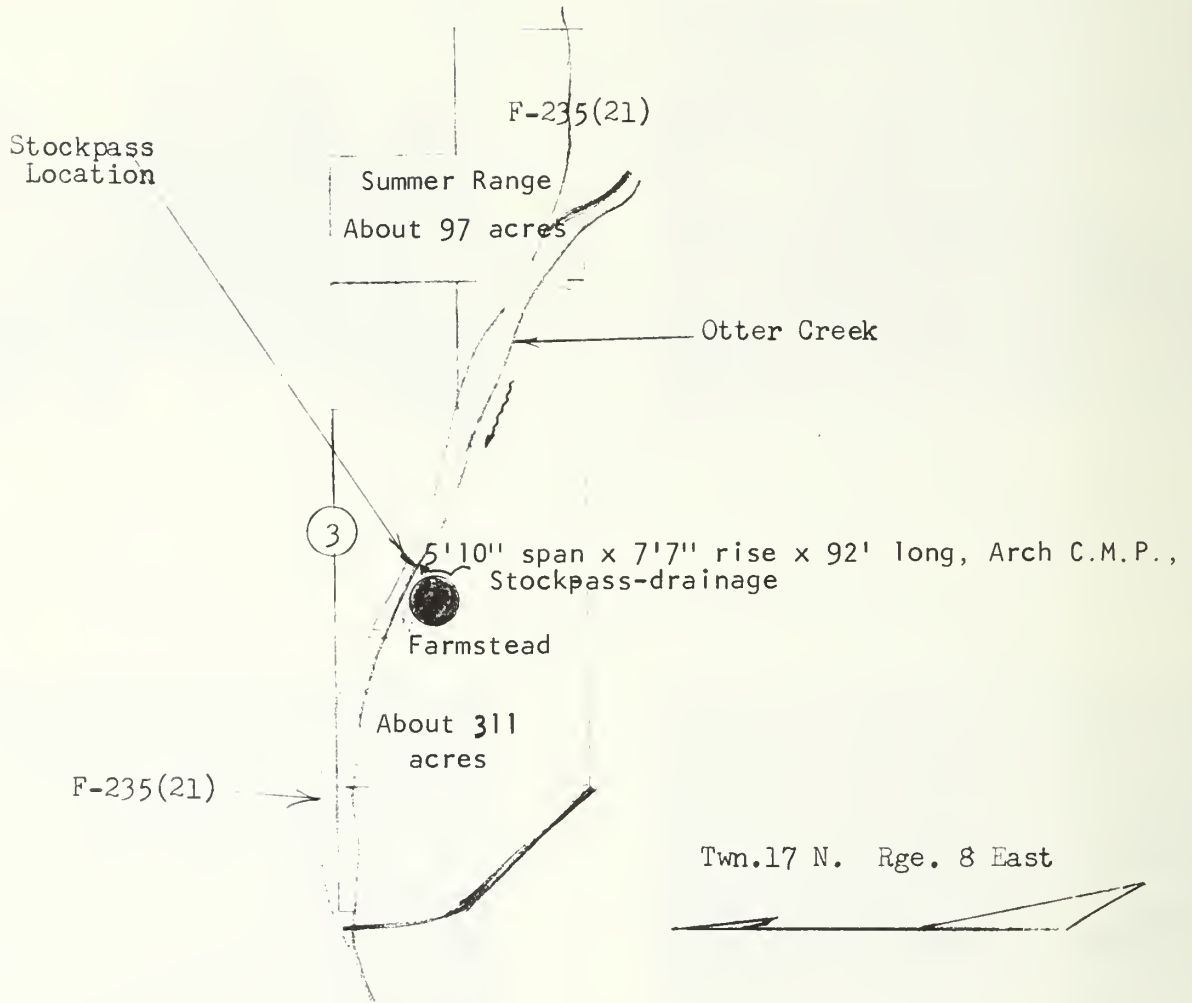


Looking East from EAST ENTRANCE



Looking West from WEST ENTRANCE
Notice steep draw

CASE STUDY No. 103
PRINCIPAL SEVERANCE SITUATION: Summer pastures
separated from headquarters and pasture
STRUCTURE AGE: 8 years
DATE: October, 1970



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 104 - Non-Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separation of a summer calf pasture from main unit.

TYPE OF OPERATION: Cow-calf -- normally runs about 180 cows and farms his cropland.

LOCATION: South of Roundup, located in Section 27, Township 6 South, Range 26 East, M.P.M., Musselshell County, Station 168+26 on Project F 108 (6).

STRUCTURE TYPE: 11'5" span x 7'3" rise x 110' long, squash C.M.P., stockpass-drainage. Actual measurements are the same with about 4 $\frac{1}{2}$ ' of fill over the pipe.

SPECIFIC PROBLEMS: The runoff creates a buildup in the east end and erodes to the point of cutting down the pavement on the west end. The topography is a fairly steep, rugged hillside on the west and naturally cuts into the hill at the outlet and drain area. About half of the width of the paved pipe approach is gone. The wash has also started to undermine the concrete wall on the west outlet. Snow is not a problem because of seasonal usage.

ADEQUACY: The owner is satisfied and very happy that he has it. It is only used twice a year when the 70-80 calves are moved to and from the east pasture. He has built holding corrals at either end of the pipe, runs the calves into the corrals, leads a saddle horse through the pipe, and the calves follow behind with no problem.

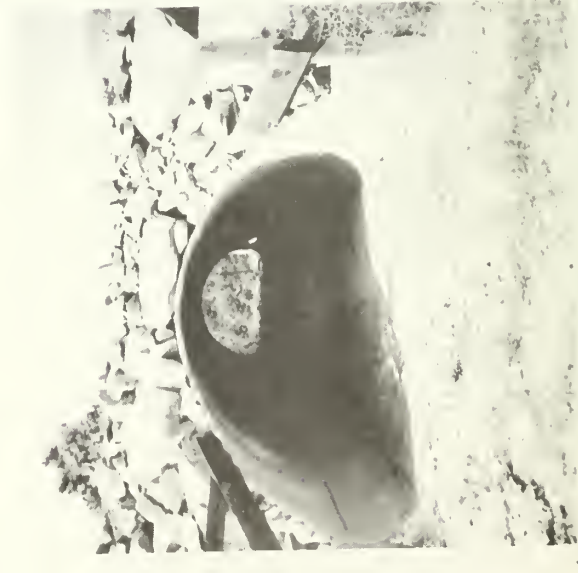
REMARKS: This appears to be a well-managed unit and the structure size and location fits the needs of this ranching operation. The west end would plague a good structure designer, let alone anybody trying to stabilize the outlet erosion through normal maintenance. A concrete stabilization over riprap was estimated at about \$1.00 per square foot, and felt to be the most logical solution.

It has recently been discovered, as of October 1971, that the eastern-most parcel has been traded for lands closer to his headquarters unit; therefore, the underpass is no longer serving the landowner.



WEST ENTRANCE
Notice erosion of paved approach

Looking down into West approach -- notice erosion of pavement



F 108 (6)
ROUNDUP-BILLINGS
11'5" span x 7'3" rise x 110' long
Squash C.M.P.
Stockpass-drainage

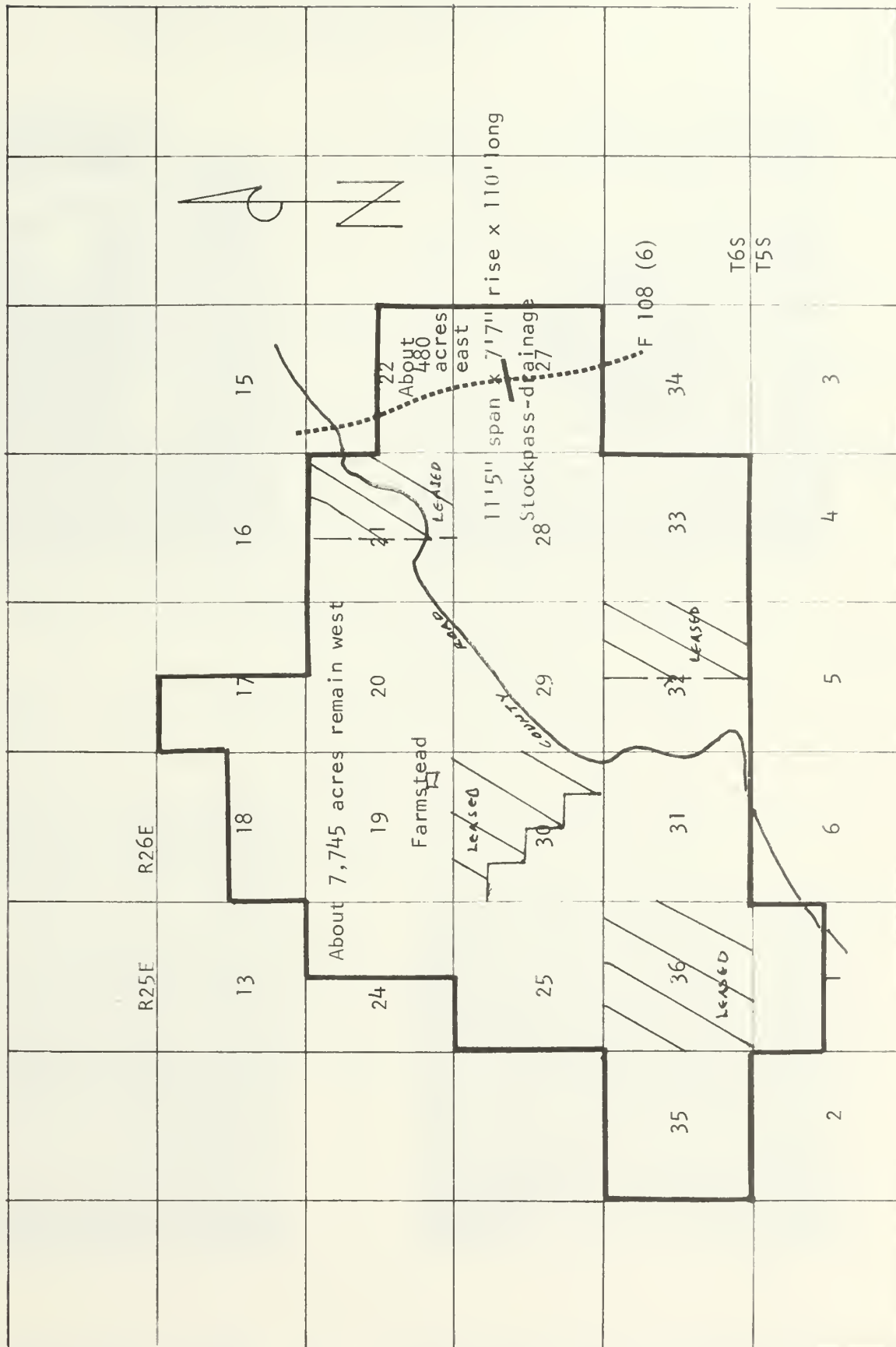
EAST ENTRANCE

Looking East from EAST ENTRANCE
Notice holding corral

OWNERSHIP PLAT

SCALE 1" = 1/4 mile Principal Severance Situation Separation of summer calf pasture from main unit

DATE 10/70 CASE STUDY NO. 104 STRUCTURE AGE 3 years PROJECT NO. F 108 (6)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 105 - Non-Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separated winter and summer pasture; about 420 acres remain north and 1,089 acres remain south.

TYPE OF OPERATION: Cow-calf and sheep -- about 300 head of cows and 50 head of ewes, 5 saddle horses.

LOCATION: West of Harlowtown, located in Section 20, Township 8 North, Range 15 East, M.P.M., Wheatland County, Station 538+40 on Project F 8 (13).

STRUCTURE TYPE: 96" diameter x 110' long, round C.M.P., stockpass-drainage. Actual measurements are the same with about 4' of fill on the pipe.

SPECIFIC PROBLEMS: The stockpass is not being used. When this project was built, the owner did the fencing, and he didn't wing the right-of-way fence into the pipe on either side. He is firmly convinced that his cattle will not use this pipe, so why bother to build the extra fence. The pipe was also intended to carry irrigation water. Because the pipe is not being used, a 90-acre pasture on the south side cannot be used along with the pasture north of right-of-way. This pasture rearrangement now consists of pasturing bulls on the 90 acres.

ADEQUACY: We cannot determine adequacy of the structure without using it. The owner does feel it to be a very poor structure. He thinks there should have been a concrete pipe because of the noise problem. He is not very happy with the Highway Commission, which may contribute to his non-use of the pipe. He did state that he would wing into the pipe and try to use it "when he had time". This pipe is not the only problem. He also stated some of his ditches were cut off so that there is about 250 acres south and 150 acres north that cannot be irrigated now. He feels the pipe should be larger and not designed to carry irrigation water.

REMARKS: This is super-adequate as an irrigation structure and, apparently, inadequate as a stockpass, from the owner's viewpoint. He will not know for sure until he tries. The grass in the structure and near the approach indicates small irrigation usage. The landowner was accustomed to a wooden bridge and probably found the adjustment to a pipe difficult. It should be classified as conditionally adequate on the condition he try to use it.

96" diameter x 110' long, round C.M.P.,
Stockpass-drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

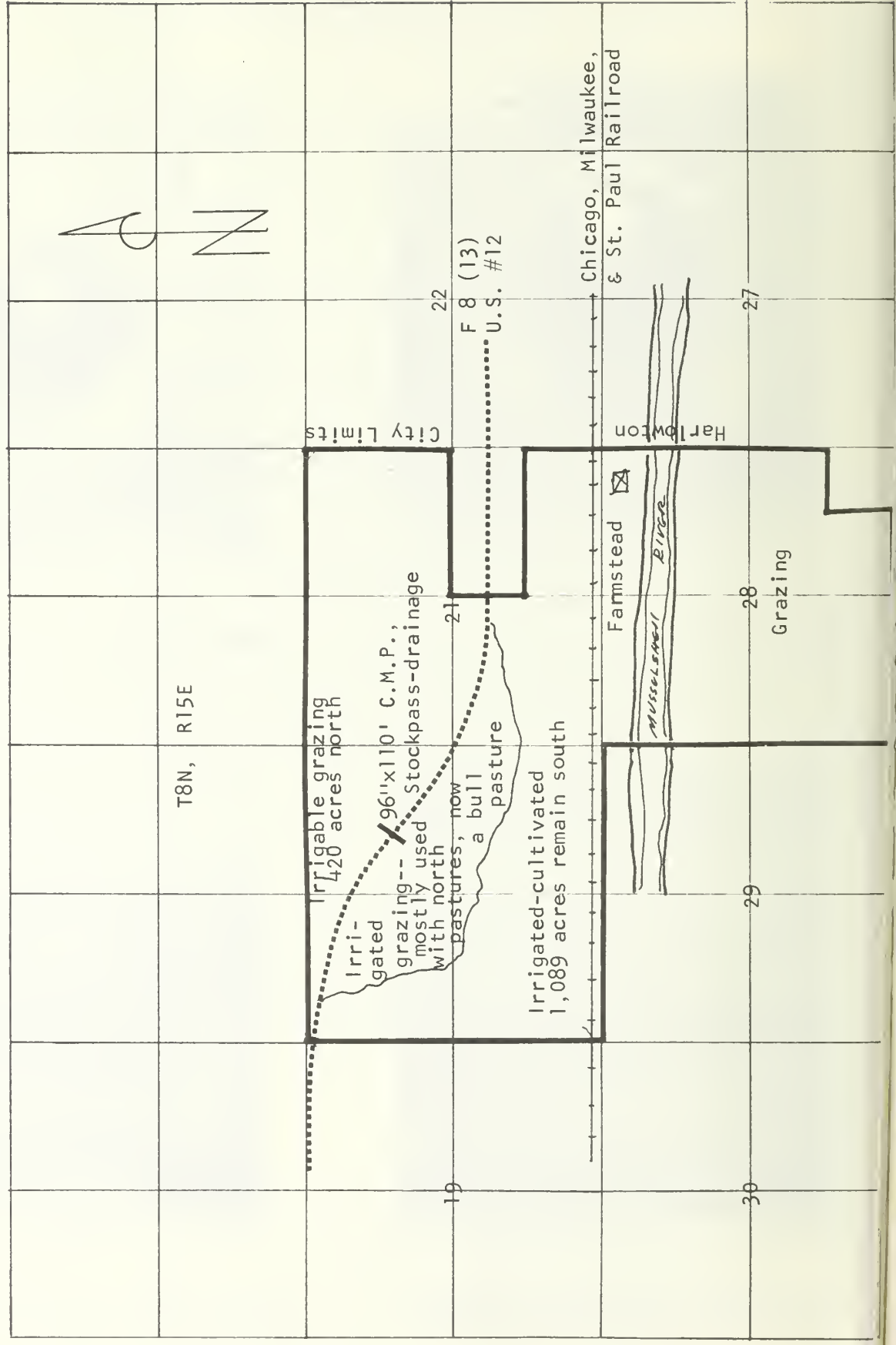


Looking South from SOUTH ENTRANCE

OWNERSHIP PLAT

SCALE 1" = 1/2 mile Principal Severance Situation Separated winter and summer pastures

DATE 10/70 CASE STUDY NO. 105 STRUCTURE AGE 4 yrs. PROJECT NO. F 8 (13)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 106 - Non-Controlled Access

DATE OF INSPECTION: September, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pasture; about 782 acres remain north and 320 acres remain south.

TYPE OF OPERATION: Cow-calf -- lessee runs about 70+ head of cows and farms dry cropland.

LOCATION: West of Harlowtown, located in Sections 13 and 24, Township 8 North, Range 14 East, M.P.M., Wheatland County, Station 421+28 on Project F 8 (13).

STRUCTURE TYPE: 96" diameter x 120' long, C.M.P., Stockpass-drainage. Actual measurements are the same with about 4' of fill.

SPECIFIC PROBLEMS: The wing fencing that was into the original timber bridge was not replaced into the new structure, for some reason. The lessee does plan to wing fence this and use it in the spring. It presently has gates in the right-of-way fence. They have switched from wheat to barley, reason unknown. The only drainage problem is from the road drainage which drains down the borrow ditch into this bottom location.

ADEQUACY: The lessee is happy with the pipe and anticipates no problems with using the pipe when he wings the fences in. The owner is disappointed with the Highway Commission because of the changes in his irrigation system, for the worse, which he attributes to the Highway Commission. There appears to be a lack of maintenance of the irrigation pipes. The location is described as the best possible for the unit. This is an adequate structure.

REMARKS: This pipe has not been used in the wintertime, but the usage appears to be intended as seasonal. The lessee is optimistic about the potential utility, and in some instances, it might be wise to recommend a certain type of wing fencing if the user requests it, depending on the location and type.

F 8 (13)
HARLOWTON-WEST

96" diameter x 120' long, C.M.P.,
Stockpass-drainage



NORTH ENTRANCE



SOUTH ENTRANCE



Looking North from NORTH ENTRANCE
Notice gate, irrigation ditch

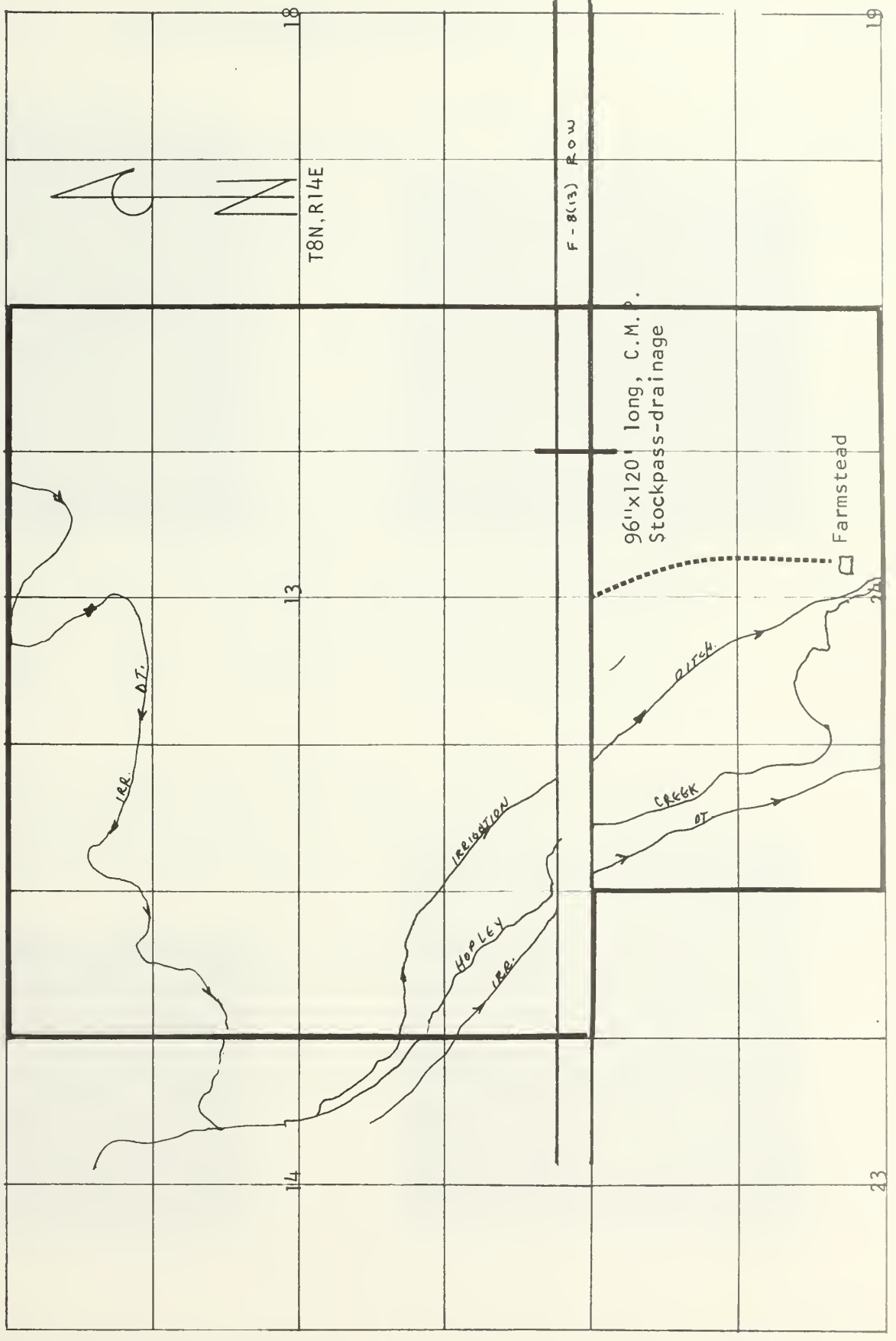


Looking South from SOUTH ENTRANCE
Notice gate in Right of Way fence

OWNERSHIP PLAT

SCALE 1" = 1/4 mile Principal Severance Situation Separated pastures

DATE 9/70 CASE STUDY NO. 106 STRUCTURE AGE 4 years PROJECT NO. F 8 (13)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 107 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures -- about 400 acres remain north and west and 634 acres remain south and east.

TYPE OF OPERATION: Yearling -- 500 to 1,500 head of steers run on this and non-contiguous properties in conjunction with a semi-feedlot type of operation. They also run a few head of cows and about 25 head of horses.

LOCATION: Near Miles City, located in Section 18, Township 8 North, Range 48 East, M.P.M., Custer County, Station 661+00 of Project 1 ING 94-4 (1).

STRUCTURE TYPE: 120" diameter x 156' long, C.M.P., stockpass-drainage. Actual measurement is 9'7" span x 9' rise and 14' of fill over the pipe.

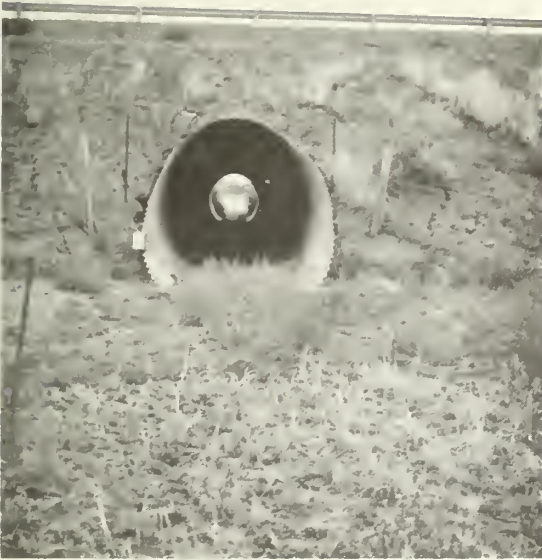
SPECIFIC PROBLEMS: The landowner has had to change some pasture fencing at a cost of \$1,250.00. He also has drilled a well south at a cost of \$1,500.00. These expenses were more than likely a result of stockpass inutility from all appearances. It is the only drainage pipe for 1½ miles and, when wet, entirely unusable. The owners use the pipe 4 to 5 times a year and have problems 100% of the time. There is either 1'+ of ice or 2'+ of mud. They are very unhappy with the situation. The Maintenance Division has never cleaned this pipe to their knowledge. They sincerely wish there were some way to prevent their constant grief and problems.

ADEQUACY: The snow is not a problem, just the mud and snow from drainage. Nothing wrong with the size of the pipe for stock usage, but a poor structure for combination usage. Inadequate for stock usage, super adequate for drainage. They feel the location should be 100 to 200 yards to the north and east. Pipe has been there for about ten years. Drainage is from the south to north.

REMARKS: The pipe is located at the bottom of a shallow long drainage which is partly dammed by a large shallow reservoir to south of pipe. The land to south raises into the badlands. The north ground is fairly level and low rolling opening into the irrigated Yellowstone Valley. Certainly two structures could have been utilized at this location. This is one of the worst situations encountered, and drainage definitely should have been separate, (at least a hundred yards away), and downhill from the stockpass.

1 ING 94-4 (1)
MILES CITY-EAST

120" diameter x 156' long, C.M.P.,
Stockpass-drainage



NORTH ENTRANCE



SOUTH ENTRANCE



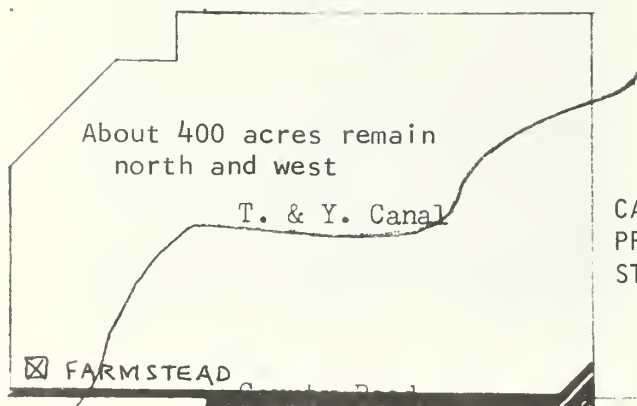
Looking North from NORTH ENTRANCE



Looking South from SOUTH ENTRANCE

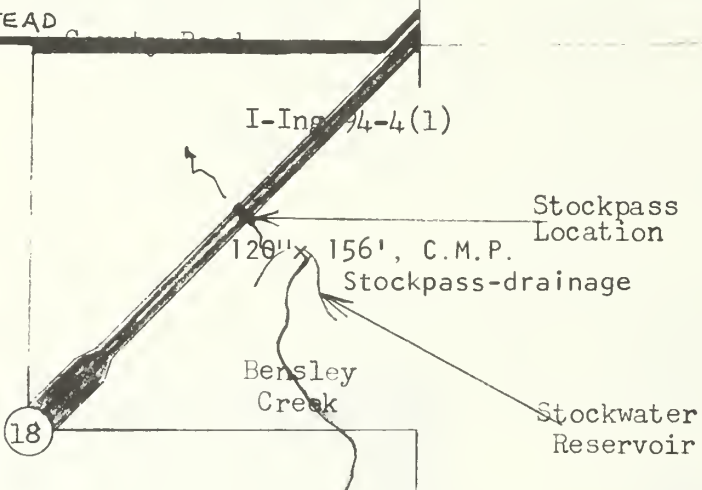
Twn. 8 No.

Rge. 48 East



CASE STUDY No. 107
 PRINCIPAL SEVERANCE SITUATION: Separated pastures
 STRUCTURE AGE: 10 years

About 634 acres remain south & east



I-Ing 4-4(1)

Stockpass Location

126' x 156', C.M.P.
Stockpass-drainage

Bensley Creek

Stockwater Reservoir

18

17

Scale 1" = 1/4 mile

LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 108 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Pastures separated; headquarters separated from larger part of unit.

TYPE OF OPERATION: Feeder -- about 500 to 1,500 head of steers, a few head of cows, and 25 saddle horses.

LOCATION: Near Miles City, located in Section 32, Township 9 North, Range 48 East, M.P.M., Custer County. Station 879+40 on Project 1 ING 94-4 (1).

STRUCTURE TYPE: 17'3" span x 16'6" rise x 124' long, arch C.M.P., stock-vehicle-drainage. Actual measurement is 16'9" span x 12'10" rise (from mud), with 4' of cover.

SPECIFIC PROBLEMS: This pipe has been a real problem to the landowner and also the Highway Commission. Maintenance has done a lot of work on the pipe. To date, it has fallen in twice, at a cost of from \$28,000 to \$30,000. This summer, the last time it caved in, Maintenance removed most of the silt buildup and completely rebuilt the pipe.

The landowner is not a very patient man and when the stock must be moved, they will move them. With the permission of the Commission, two gates have been put in the control access fence so the stock can be crossed if the pipe is unsuitable. The owner says it takes five riders three hours to run 400 steers through the pipe, if it is passable at all. Early this spring, the owners got the Highway Commission to pull two 4-wheel drive pickups out of this pipe. Both were stuck tight. A boom truck was necessary to do this because of the depth of silt and mud.

ADEQUACY: The owners are satisfied with the size of the pipe and its location. They are justifiably unhappy with the mud and ice problem, considering the type of operation they run. This pipe would be considered barely adequate under certain conditions.

REMARKS: The landowner's only suggestion to partly remedy this problem would be to build up a ramp, say 2½' high down the center of this pipe, and leave a lowered "sump" on either side for the runoff to wash through the pipe. They feel that stock would walk through on the raised ramp. The reality of this suggestion is that the sumps most likely would fill up and the silt would rise above the ramp, making it impossible to clean out with a scoop or grader. The solution would, therefore, require a minimum of once a year maintenance on the part of the Highway Commission. The investigator feels it might be more economical than the more or less constant harassment by the landowners.

Apparently the present owner's father insisted on this large pipe rather than a smaller pipe, so that a loaded hay truck could drive through. It appears that the present owners have no need for such a large pipe. It is possible that when the additional two lanes are put in, this pipe could be reduced in size to get the necessary cover to keep the structure from falling in again, if this is the cause of the failure.

1 ING 94-4 (1)
MILES CITY-EAST

17'3" span x 16'6" rise x 124' long,
Arch C.M.P.
Stock-vehicle-drainage



NORTHWEST ENTRANCE



SOUTHEAST ENTRANCE



Looking Northerly from NORTHWEST ENT.

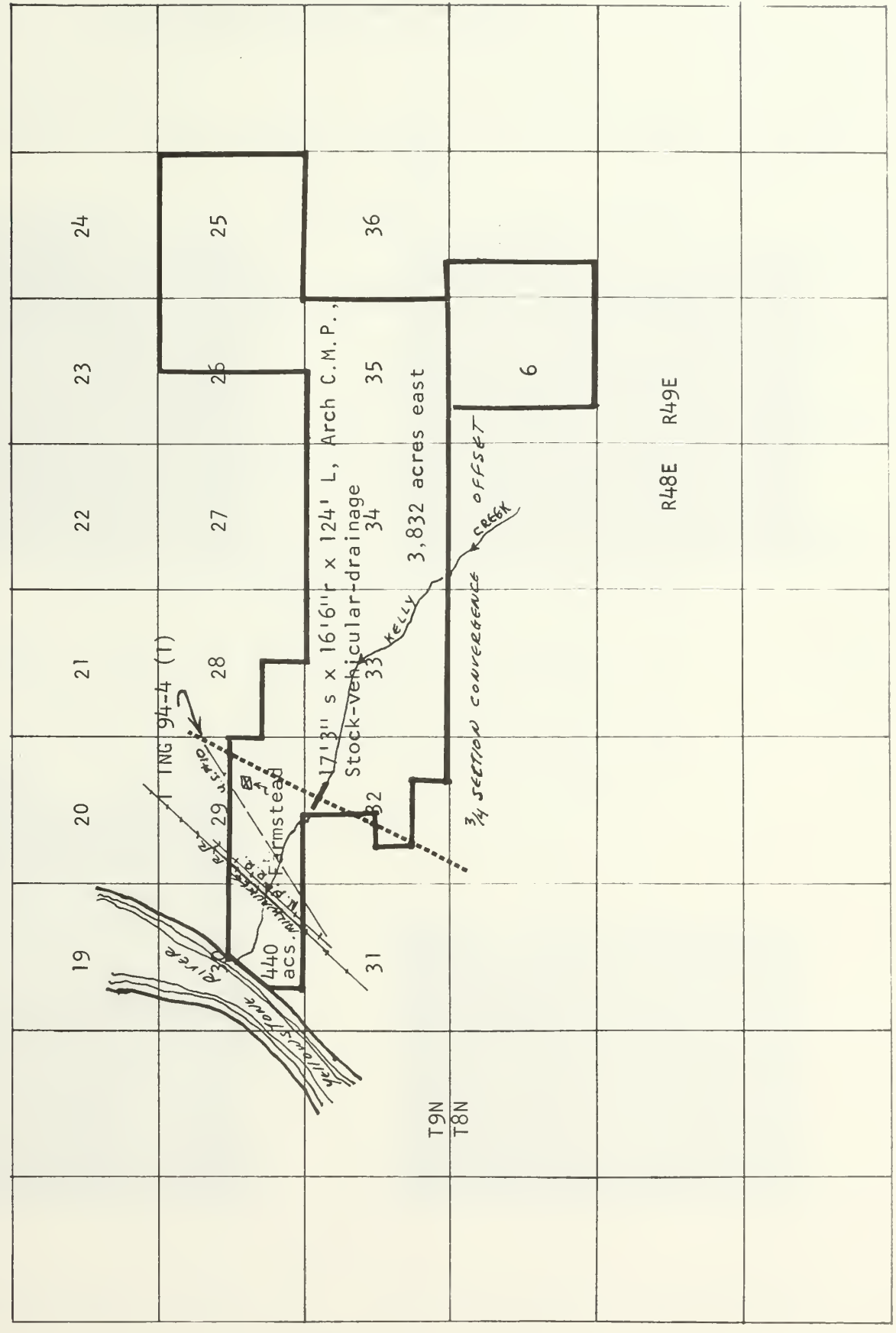


Looking Southerly from SOUTHEAST ENT.

OWNERSHIP PLAT

SCALE 1"=1 mile Principal Severance Situation Separated pastures

DATE 10/70 CASE STUDY NO. 108 STRUCTURE AGE 10 years PROJECT NO. I ING 94-4 (1)



LIVESTOCK AND VEHICULAR UNDERPASSES

CASE STUDY NO. 110 - Controlled Access

DATE OF INSPECTION: October, 1970

PRINCIPAL SEVERANCE SITUATION: Separated pastures, as well as separation from stock water.

TYPE OF OPERATION: Cow-calf -- about 600 head of cows and calves and 12 to 15 horses on this, plus other lands.

LOCATION: Near Miles City, located in Section 8, Township 8 North, Range 48 East, M.P.M., Custer County, Station 738+50 on Project 1 ING 94-4 (1).

STRUCTURE TYPE: 14' span x 10' rise x 44' long, concrete bridge-type box. Actual measurements are the same.

SPECIFIC PROBLEMS: The only worry of the present landowner is a possible flash flooding of his home. The underpass would direct all of the runoff directly towards his home. This is not an unfounded fear because it has happened once before.

ADEQUACY: The landowner is happy with this underpass, considers it adequate, and in the best location despite its possible deficiencies. It has been here four years and still feels quite positively towards it.

REMARKS: The photo looking north shows the justifiable concern regarding runoff, if it is large. Looking south does not adequately portray a heavy runoff area. Lending credence to this man's testimony, a gravel and dirt dike would divert this potential runoff from his house. This would not be an expensive item during construction if the landowner is agreeable to it.

1 ING 94-4 (1)
MILES CITY-EAST

14' span x 10' rise x 44' long
Concrete bridge-type structure



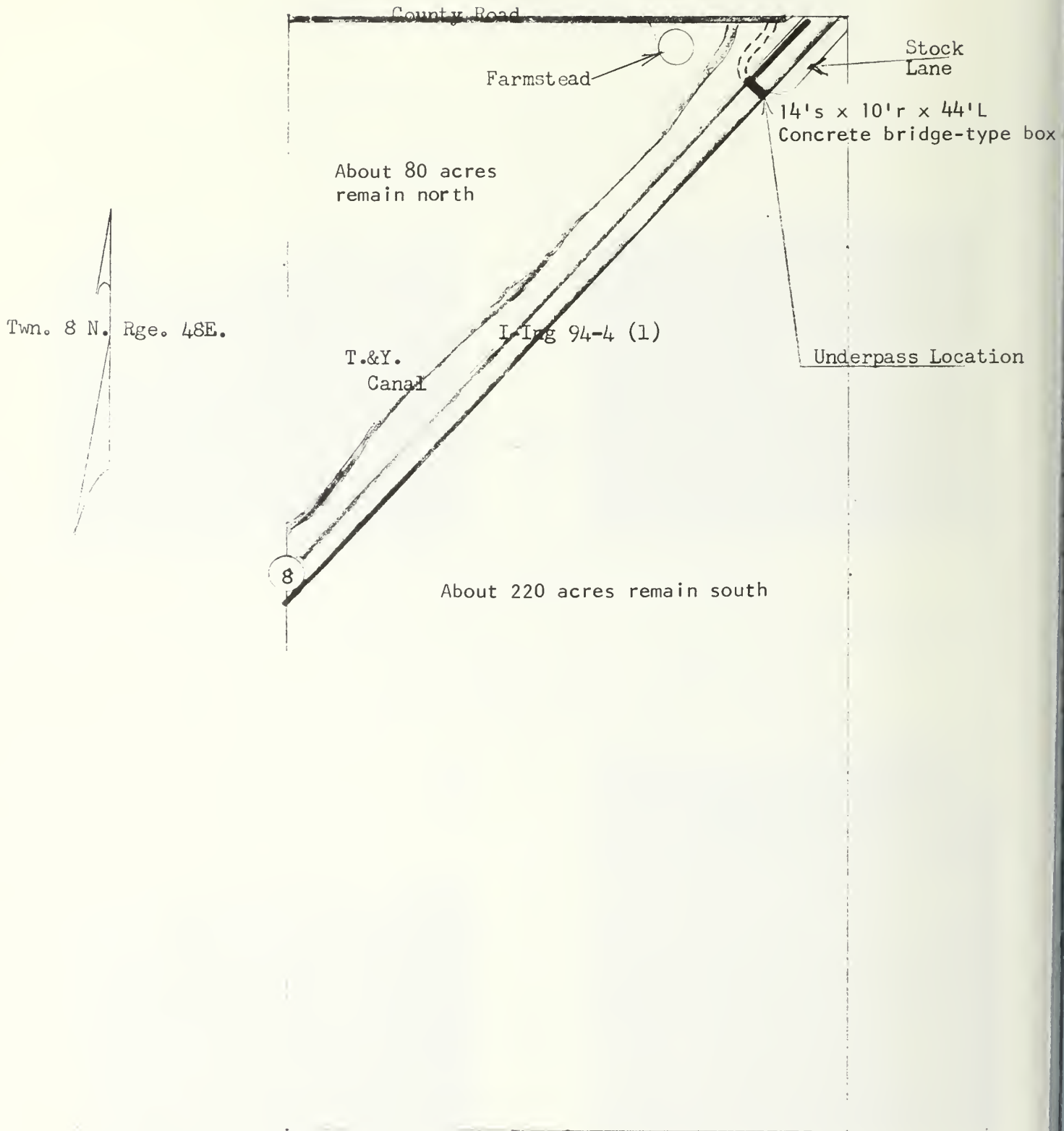
NORTH ENTRANCE

SOUTH ENTRANCE



Looking North from NORTH ENTRANCE

Looking South from SOUTH ENTRANCE



PRINCIPAL SEVERANCE SITUATION: Separated Pastures
STRUCTURE AGE: 10 years

Scale 1"=1/8 mile

